SYSTEM SCHEMATICS

A500

REVISIONS 5, 6A, 7

INCLUDES A501 REV 6C

AUGUST, 1989 **PN-314981-02**

Commodore

COMPONENT PARTS LIST
PCB ASSEMBLY #321510, A500, REV. 5

321510-05 PCB ASSY, A500 NTSC 321510-06 PCB ASSY, A500 PAL

Commodore part numbers are provided for reference only and do not indicate the availability of parts from Commodore. Industry standard parts (Resistors, Capacitors, Connectors) should be secured locally. Approved cross-references for TTL chips, Transistors, etc. are available in manual form through the Service Department, order #314000-01.

IC COMPONENTS		
390084-03	M68000, 8 MHz	U1
318070-01	FAT AGNUS, 8370R3 NTSC	U2
318071-01	FAT AGNUS, 837[illegible]1, PAL	U2
252127-02	PAULA, 8364R7	U3
252126-02	DENISE, 8362R8	U4
318072-01	GARY 5719	U5
318029-01	8520R4	U5
315093-01	ROM, KICKSTART V1.3	U5
390226-01	256K X 1 BIT DYNAMIC RAM	U16-U31
380223-01	256K X 1 BIT DYNAMIC RAM	U16-U31
901882-01	1488	U38
901883-01	1489	U39
390086-01	LF347/TL084	U14
390110-01	74F04	U33
901521-31	74LS32	U37
901521-38	74LS38	U36
390081-01	74F74	U32
901521-11	74LS157	U15
318050-01	74F244	U34,U35
901521-13	74LS244	U10,U12
310003-01	74HC245	U40,U41
901521-29	74LK373	U11,U13
901523-01	NE555	U42
252126-01	DENISE, 8362R6	U4
380223-05	DRAM, 256K X 1 BIT, 80ns	U16-U31

CONNECTORS		
252167-01	DIN, 5 PIN, SQUARE, FEMALE	CNB
390242-01	D-SUB, 9 PIN, MALE, RA, SOLDER-IN	CN1,CN2
390242-03	D-SUB. 23 PIN, MALE, RA, SOLDER-IN	CN9
390241-03	D-SUB/23PIN/FEMALE/RA/SOLDER-IN	CN5
390242-05	D-SUB/25PIN/MALE/RA/SOLDER-IN	CN6
390241-05	D-SUB/25PIN/FEMALE/RA/SOLDER-IN	CN7
252122-04	RCA JACK, BLACK	CN3
252122-01	RCA JACK, WHITE	CN4
252122-03	RCA JACK, YELLOW	CN10
390248-01	RCA JACK, METAL	CN3,CN4,CN10
325516-04	HEADER, 4PIN, POLARIZED, SIL	CN12
903326-08	HEADER, 8PIN, SIL	CN13
903345-17	HEADER, 34PIN, DIL	CN11
390224-01	HEADER/DUAL/RA/LONG/56POS/MALE	CNX

RESISTORS		
902410-18	NETWORK, 10K X 9 10PIN	RP501
390227-03	NETWORK, 22 OHM X 5, 10PIN	RP103
902422-05	NETWORK, 47 OHM X 4, 8PIN	RP102,RP403
902422-06	NETWORK, 68 OHM X 4, 8PIN	RP210,RP202
390227-05	NETWORK, 68 OHM X 5, 10PIN	RP203
902441-10	NETWORK, 120 OHM X 5, 6PIN	RP405
902442-17	NETWORK, 470 OHM X 7, 8PIN	RP104
902410-08	NETWORK, 4.7K X 9, 10PIN	RP101,RP102,RP401, RP501
902422-06	NETWORK, 68 OHM X 4, 8PIN	RP404
390186-01	ZERO OHM RESISTOR	W1,W2
901550-118	1 OHM, 5% 1/4W	EM1301,EM1406
901550-129	5.1 OHM, 5% 1/4W	EM1401,R405,R406
901550-64	10 OHM, 5% 1/4W	R301,R302
901550-90	27 OHM, 5% 1/4W	R101,R102
901600-15	47 OHM, 5% 1/2W	EM1501,EM1503
901550-138	360 OHM, 5% 1/4W	R331,4321
901550-57	390 OHM, 5% 1/4W	R325,R335
901550-58	470 OHM, 5% 1/4W	R305
901550-01	1K OHM, 5% 1/4W	R303,R304,R324,R334, R713,R305
901550-17	1.2K OHM, 5% 1/4W	R704
901550-23	2.7K OHM, 5% 1/4W	R701
901550-39	3.9K OHM, 5% 1/4W	R702
901550-19	4.7K OHM, 5% 1/4W	R402,R403,R502-R504
901550-20	10K OHM, 5% 1/4W	R322,R323,R333,R339, R501,R505,R506
901550-15	27K OHM, 5% 1/4W	R703

RESISTORS *(Continued)*		
901550-22	47K OHM, 5% 1/4W	R712
901550-84	1M OHM, 5% 1/4W	R711
901550-75	120 OHM, 5% 1/4W	R103-R108
901550-20	10K OHM, 5% 1/4W	R306,R308
901550-23	2.7K OHM, 5% 1/4W	R307
901550-82	470K OHM, 5% 1/4W	R326,R336
901550-89	150 OHM, 5% 1/4W	R409

BEADS/FILTERS		
252133-01	FERRITE BEAD	RB801,RB802
903025-01	FERRITE BEAD	FB802,FB801, EMI411-EMI417, EMI421-EMI427
903025-01	FERRITE BEAD	FB802,FB101 EMI411-EMI417, EMI421-EMI427, EMI402-EMI431-EMI435
251842-02	EMI FILTER, 100 pf	EMI301-EMI303, EMI401-EMI405, EMI411-EMI417, EMI421-EMI427, EMI431-EMI435, EMI511-EMI538, EMI601-EMI611-EMI626,EMI701-EMI704
251842-02	EMI FILTER, 100 pf	EMI101,EMI302, EMI303,EMI305, EMI306,EMI402-EMI404,EMI407, EMI431-EMI435, EMI511-EMI524, EMI531-EMI538, EMI601,EMI611-EMI626,EMI702-EMI704
251842-02	EMI FILTER, 100 pf	EMI101,EMI302, EMI303,EMI305, EMI306,EMI403-EMI407,EMI511-EMI524,EMI531-EMI538,EMI601, EMI602,EMI611-EMI626,EMI701, EMI702

CAPACITORS		
900462-27	39 pF, MLC, AXIAL, NPO	C703
900462-37	100 pF, MLC, AXIAL, NOP	C704
900463-16	1000 pF MLC AXIAL X7R	C705
900463-16	1000 pF MLC AXIAL X7R	C411-C413,C421-C423
900463-23	3900 pF MLC AXIAL X7R	C323,C333
900463-26	6800 pF MLC AXIAL X7R	C322,C332
390082-02	.01 uF MLC AXIAL Z5U	C410,C412,C801,C713
390082-02	.01 uF MLC AXIAL Z5U	C308,C713
900463-36	.047 uF MLC AXIAL X7R	C311-C314
390082-01	.1 uF MLC AXIAL Z5U	C7,C8,C10,C11-C13, C15,C33-C37,C39, C321,C331,C711, C701(-01 & -02)
390082-05	.22 uF MLC AXIAL Z5U	C1-C6,C16-C32,C14, C40-C42,C301,C302, C305,C501,C502
390082-05	.22 uF MLC AXIAL Z5U	C325,C335
390101-06	10 uF ELECT RADIAL	C306,C712
390101-04	22 uF ELECT RADIAL	C303,C304,C307,C334
390101-01	47 uF ELECT RADIAL	C812-C815,C821,C822
390101-02	100 uF ELECT RADIAL	C307,C811
900100-56	3300 uF 10 V ELECT RADIAL	C401,C402
251029-06	VARIABLE CAP 4.5-45 pf	C702

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Schematics #312511-03, Rev. 6A/7	14
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COMPONENT PARTS LIST
PCB ASSEMBLY #321510, A500, REV. 5

321510-05 PCB ASSY, A500 NTSC **321510-06 PCB ASSY, A500 PAL**

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390242-01	D-SUB, 9 PIN, MALE, RA, SOLDER-IN	CN1,CN2
390242-03	D-SUB, 23 PIN, MALE, RA, SOLDER-IN	CN9
390241-03	D-SUB/23PIN/FEMALE/RA/SOLDER-IN	CN5
390242-05	D-SUB/25PIN/MALE/RA/SOLDER-IN	CN6
390241-05	D-SUB/25PIN/FEMALE/RA/SOLDER-IN	CN7
252122-04	RCA JACK, BLACK	CN3
252122-01	RCA JACK, WHITE	CN4
252122-03	RCA JACK, YELLOW	CN10
390248-01	RCA JACK, METAL	CN3,CN4,CN10
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903326-08	HEADER, 8PIN, SIL	CN13
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901600-15	47 OHM, 5% 1/2W	EM1501,EM1503
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901550-57	390 OHM, 5% 1/4W	R325,R335
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903025-01	FERRITE BEAD	FB802,FB801, EMI411-EMI417, EMI421-EMI427
903025-01	FERRITE BEAD	FB802,FB101 EMI411-EMI417, EMI421-EMI427, EMI402-EMI431-EMI435
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900463-16	1000 pF MLC AXIAL X7R	C411-C413,C421-C423
900463-23	3900 pF MLC AXIAL X7R	C323,C333
900463-26	6800 pF MLC AXIAL X7R	C322,C332
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390082-02	.01 uF MLC AXIAL Z5U	C308,C713
900463-36	.047 uF MLC AXIAL X7R	C311-C314
390082-01	.1 uF MLC AXIAL Z5U	C7,C8,C10,C11-C13, C15,C33-C37,C39, C321,C331,C711, C701(-01 & -02)
390082-05	.22 uF MLC AXIAL Z5U	C1-C6,C16-C32,C14, C40-C42,C301,C302, C305,C501,C502
390082-05	.22 uF MLC AXIAL Z5U	C325,C335
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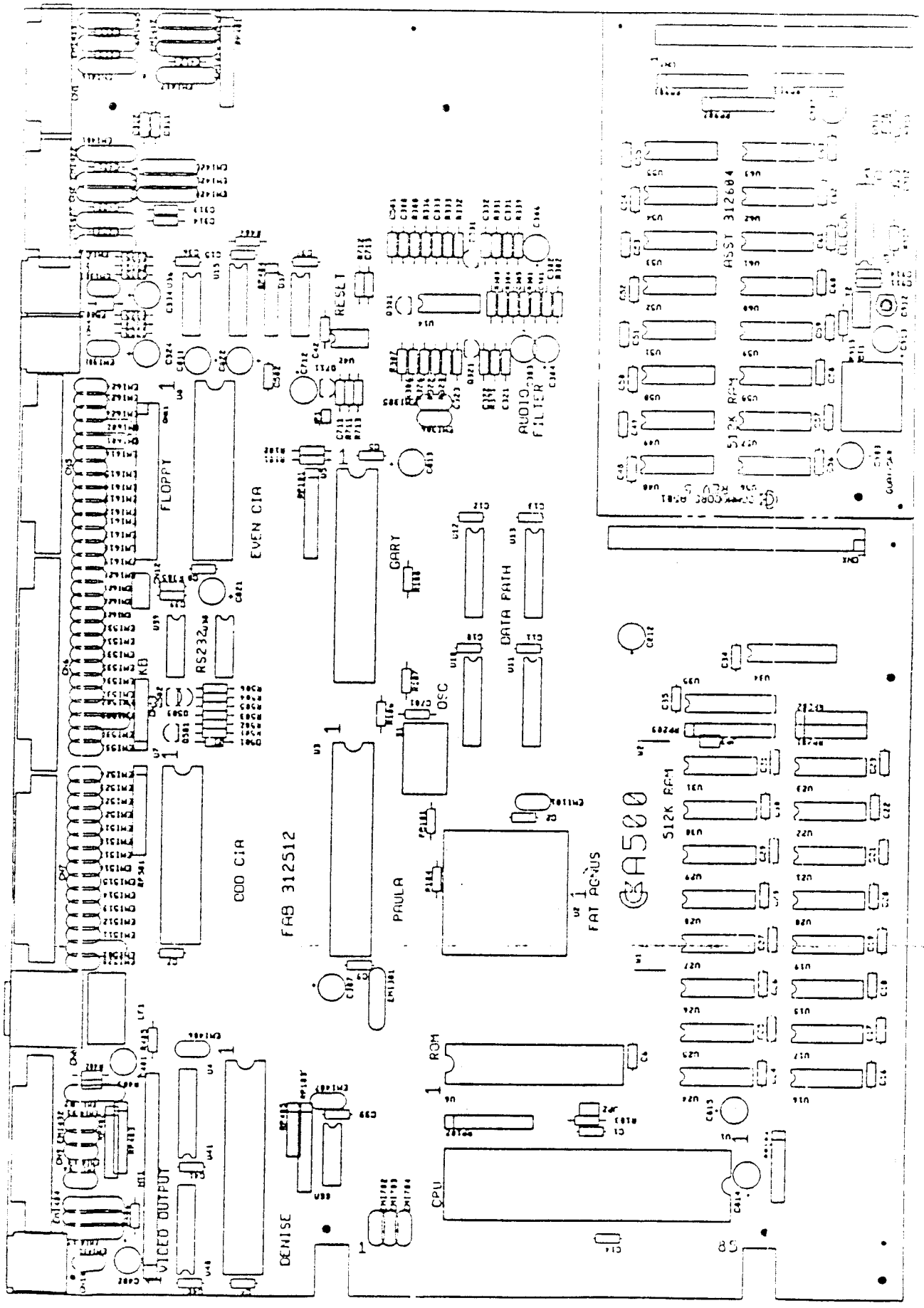
390101-04	22 uF ELECT RADIAL	C303,C304,C307,C334
390101-01	47 uF ELECT RADIAL	C812-C815,C821,C822
390101-02	100 uF ELECT RADIAL	C307,C811
900100-56	3300 uF 10 V ELECT RADIAL	C401,C402
251029-06	VARIABLE CAP 4.5-45 pf	C702

COMPONENT PARTS LIST
PCB ASSEMBLY #321510, A500, REV. 5 *(Continued)*

TRANSISTORS/DIODES		
390239-01	TRANS 2N5770 NPN OSC.	Q701
902658-01	TRANS 2N3904 NPN GP	Q501,Q711
902707-01	TRANS 2N3906 PNP GP	Q502,Q503,Q301
390254-01	TRANS JFET PN4302 MPF-102	Q321,Q331
900850-01	DIODE, 1N4148	D501
CRYSTALS		
900556-11	28.63636 MHz	Y1
900556-12	28.37516 MHz	Y1
325566-14	OSCILLATOR, 28.63636 MHz	X1
252344-01	OSCILLATOR, 28.37515 MHz	X1
MISCELLANEOUS		
390229-02	VIDEO HYBRID	HY1
390229-01	VIDEO HYBRID	HY1
251878-02	LINE FILTER, 8PIN	LF1
901151-19	CHOKE, 3.3 uH	L701

MISCELLANEOUS *(Continued)*		
904150-06	SOCKET, 40 PIN DIP	U6-U8
251313-01	SOCKET, 48 PIN DIP	U3-U5
251313-02	SOCKET, 48 PIN DIP	U3-U5
390185-01	SOCKET, 84 PIN PLCC	U2
904150-10	SOCKET, 64 PIN DIP	U1
312519-01	WIRE ASSEMBLY JUMPER	
900462-37	CAP 100 pF MLC AXIAL NOP	C101,R106,R107,R108, R103,EMI402
390082-02	CAP 0.01 uF MLC AXIAL Z5U	C801-C803
380223-03	IC, 256K X 1 BIT DYNAMIC RAM	U16-U31
390226-03	IC, 256K X 1 BIT DYNAMIC RAM	U16-U31
390226-05	IC, 256K X 1 BIT DYNAMIC RAM	U16-U31
901550-94	RES 68 OHM 5% 1/4W	
900463-36	CAP .047 uF MLC AXIAL X7R	
320481-01	SHRINK TUBING .50 IN. LG.	
312511-01	SCHEMATIC	



A500 Board Layout #312510, Rev. 5

Jumpers and Stuff

REF	TYPE	DESCRIPTION	PAGE
JP1	BLOB	Keyboard Reset	7
JP2	BLOB	Memory Addr. C0 vs 08	2
JP3	BLOB	Int. Memory Ras0 vs 1	3
			4
TP1	POST	RTC Frequency Test	9
C912	TRIM	RTC Frequency Adjust	9
WJ-2	0 Ohm	Ground Continuity FCC	8

Connectors

REF	TYPE	DESCRIPTION	PAGE
CN1	DB9P	Mouse/Joystick 1	5
CN2	DB9P	Mouse/Joystick 2	5
CN3	RCA-J	Right Audio Output	4
CN4	RCA-J	Left Audio Output	4
CN5	DB23S	External Floppy	7
CN6	DB25P	RS232 Serial Port	6
CN7	DB25S	Parallel Printer Port	6
CN8	SQ DIN	Power Supply Connector	8
CN9	DB23P	Video Output	5
CN10	RCA-J	Composite Video	5
CN11	DIL-34	Internal Floppy Signal	7
CN12	SIL-4	Internal Floppy Power	8
CN13	SIL-8	Keyboard Connector	6
P1	EDGE86	Expansion Connector	7
CNX	RA-56M	Mem. Exp. Main-Board	3
CNY	RA56-F	Mem. Exp. Sub-Board	9

ECO Log

ECO NUMBER	DESCRIPTION	DATE
B70152	Additional Parts for FCC	05/12/87
B70222	The "Transistor Fix"	05/16/87
B70302	Change R1 resistor for F1Z	10/09/87
B70207	More FCC Changes	09/04/87
B80238	Add E Clock Termination	03/03/89

Signal Glossary

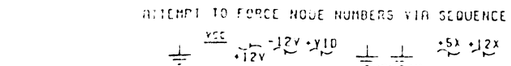
SIGNAL	DESCRIPTION (AREA)	PAGES
28MHZ	28.63636 MHz Master Clock	2
7MHZ	7.15909 MHz Processor Clock	2,5
A[23:1]	Processor Address Bus (68000)	2,3,7,9
ACK	Data Acknowledge (Parallel Port)	6
AS	Address Strobe (68000)	2,7
AUDIN	Audio Input (RS232 Port)	4,6
AUDOUT	Audio Output (RS232 Jack)	4,6
BERR	Bus Error (68000)	2,7
BG	Bus Grant (68000)	2,7
BGACK	Bus Grant Acknowledge (68000)	2,7
BLISS	Blitter Slowdown (Chips)	2
BLIT	Chip Memory Access (Chips)	2,7
BR	Bus Request (68000)	2,7
BUSY	Device Busy (Parallel Port)	6
CASL/U	Column Address Strobe (DRAM)	2,3,9
CCK/CCKQ	Color Clock / Quadrature (Chips)	2,4,7
CDAC	7.15909 MHz Quadrature Clock (Chips)	2,5,7
CHNG	Media Change (Floppy)	6,7
CLKRD/WR	Read-Time Clock Read / Write (RTC)	2,9
COMP	Monochrome Composite Video (Video)	5
CSYNC	Composite Sync (Video)	2,5
CTS	Clear to Send (RS232 Port)	6
D[15:0]	Processor Data Bus (68000)	2,3,6,7,9
DIR	Step Direction (Floppy)	6,7
DKRD	Disk Read Data (Floppy)	4,7
DKWD	Disk Write Data (Floppy)	4,7
DKWE	Disk Write Enable (Floppy)	4,7
DMAL	Chip DMA Request Line (Chips)	2,4
DRA[8:0]	DRAM Address Bus (DRAM)	2,3,9
DRD[15:0]	DRAM Data Bus (DRAM)	2,3,4,5,9
DSR	Data Set Ready (RS232 Port)	6
DTACK	Data Transfer Acknowledge (68000)	2,3,7
DTR	Data Terminal Ready (RS232 Port)	6
E	Peripheral Enable Clock (68000)	2,6,7
EXRAM	Expansion Memory Present	2,3,9
FC[2:0]	Function Code (68000)	2,7
FIRE0/1	Fire Button 0/1 (Joysticks)	2,5,6
HLT	Processor Halt (68000)	2,7
HSYNC	Horizontal Sync (Video)	2,5,6
INDEX	Index Pulse (Floppy)	6,7
INT[2,3,6]	Interrupt Request (Chips)	2,4,6,7
IORESET	I/O Reset	6,7
IPL[2:0]	Interrupt Priority Level (68000)	2,4,7
KBCLOCK	Keyboard Clock (Keyboard)	6
KBDATA	Keyboard Data (Keyboard)	6
KBRESET	Keyboard Reset (Keyboard)	6
LDS/UDS	Upper / Lower Data Strobes (68000)	2,7
LED	Power On LED / Audio Filter Disable	4,6

SIGNAL	DESCRIPTION (AREA)	PAGES
LEFT/RIGHT	Left Right Audio (Audio)	4
MTR	Motor On (Floppy)	4,6
MTR0	Motor On - Drive 0 (Floppy)	4,6,7
M0V/M0H	Mouse 0 Quadrature V/H (Joysticks)	5
M1V/M1H	Mouse 1 Quadrature V/H (Joysticks)	5
OVL	Overlay ROM over RAM	2,6
OVR	Override System Decoding	2,7
PIXELSW	Genlock Pixel Switch (Video)	5
POT0X/0Y	Pot Lines 0 X/Y (Joysticks)	4,5
POT1X/1Y	Pot Lines 1 X/Y (Joysticks)	4,5
POUT	Paper Out (Parallel Port)	6
PPD[7:0]	Parallel Port Data (Parallel Port)	6
RAMEN	RAM Enable (Chips)	2
REGEN	Chip Register Enable (Chips)	2
RAS0/1	Row Address Strobe (DRAM)	2,3,9
RDY	Drive Ready (Floppy)	6,7
RESET	General Reset	6,7
RGA[8:1]	Register Address Bus (Chips)	2,4,5
R/G/B	Red / Green / Blue (Video)	5
RI	Ring Indicate (RS232 Port)	6
ROMEN	ROM Enable (ROM)	2,3
RTS	Request to Send (RS232 Port)	6
RST	Processor Reset (68000)	2,4,7
RXD	Receive Data (RS232 Port)	4,6
RW	Processor Read/Write (68000)	2,6,7
SEL	Select (Parallel Port)	6
SEL[3:0]	Drive Select (Floppy)	4,6,7
SIDE	Side Select (Floppy)	6,7
STEP	Step In/Out Command (Floppy)	6,7
TRK0	Track Zero Sense (Floppy)	6,7
TXD	Transmit Data (RS232 Port)	4,6
VMA	Valid Memory Address (68000)	2,6,7
VPA	Valid Peripheral Address (68000)	2,7
VSYNC	Vertical Sync (Video)	2,5,6
WE	Write Enable (DRAM)	2,3,9
WPROT	Write Protect Sense (Floppy)	6,7
XCLK	External Genlock Clock (Video)	2,5
XCLKEN	External Clock Enable (Video)	2,5
XRDY	External Data Ready	2,5

Key Components

REF	CHIP	DESCRIPTION	PAGE
U1	68000	68000 Processor	2
U2	8370	Fat Agnus - NTSC	2
	8371	Fat Agnus - PAL	alt
	8372	Agnus HR	alt
U3	8364	Paula	4
U4	8362	Denise	5
	8373	Denise HR	alt
U5	5719	Gary	2,4
U6	osst	ROM 128Kx16, 200 nS	3
U7-8	8520	Amiga VIA, 1 MHz	6
U9	6242B	OKI Bus RTC	9
U14	LF347	BIMOS Op-Amp	4
	TL084	BIMOS Op-Amp	alt
U38	1488	EIA Line Driver	4
U39	1489	EIA Line Receiver	4
U42	NE555	Timer	7
U16-31	osst	DRAM 256Kx1, 150 nS	3
U46-63	osst	DRAM 256Kx1, 150 nS	9
X1	OSC	TTL 28.63636 MHz NTSC	2
	OSC	TTL 28.37512 MHz PAL	alt
Y2	XTAL	Watch Type 32768 Hz	9
HY1	osst	Video Hybrid	5

ATTEMPT TO FORCE NODE NUMBERS VIA SEQUENCE



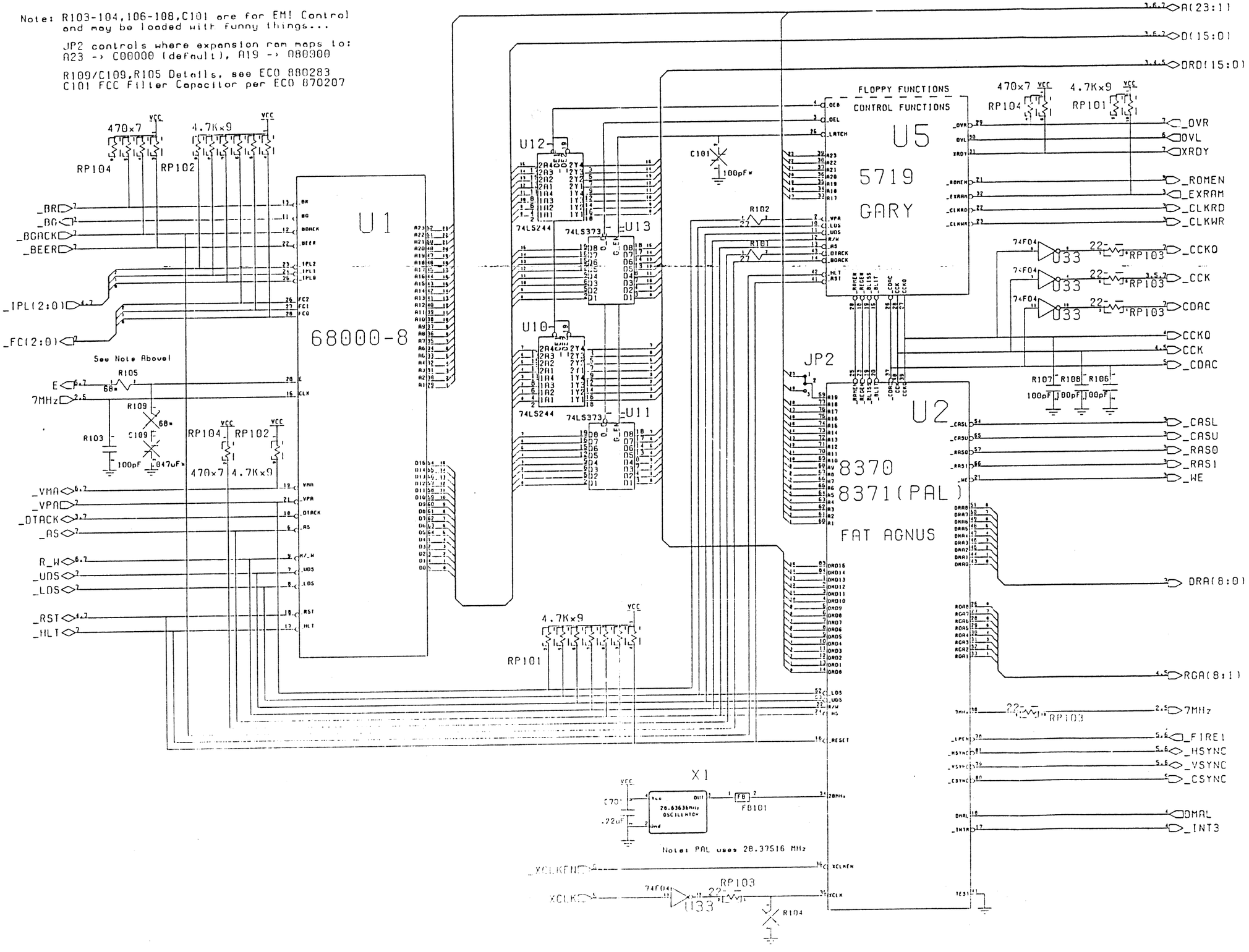
Schematic #312511-02, Rev. 5

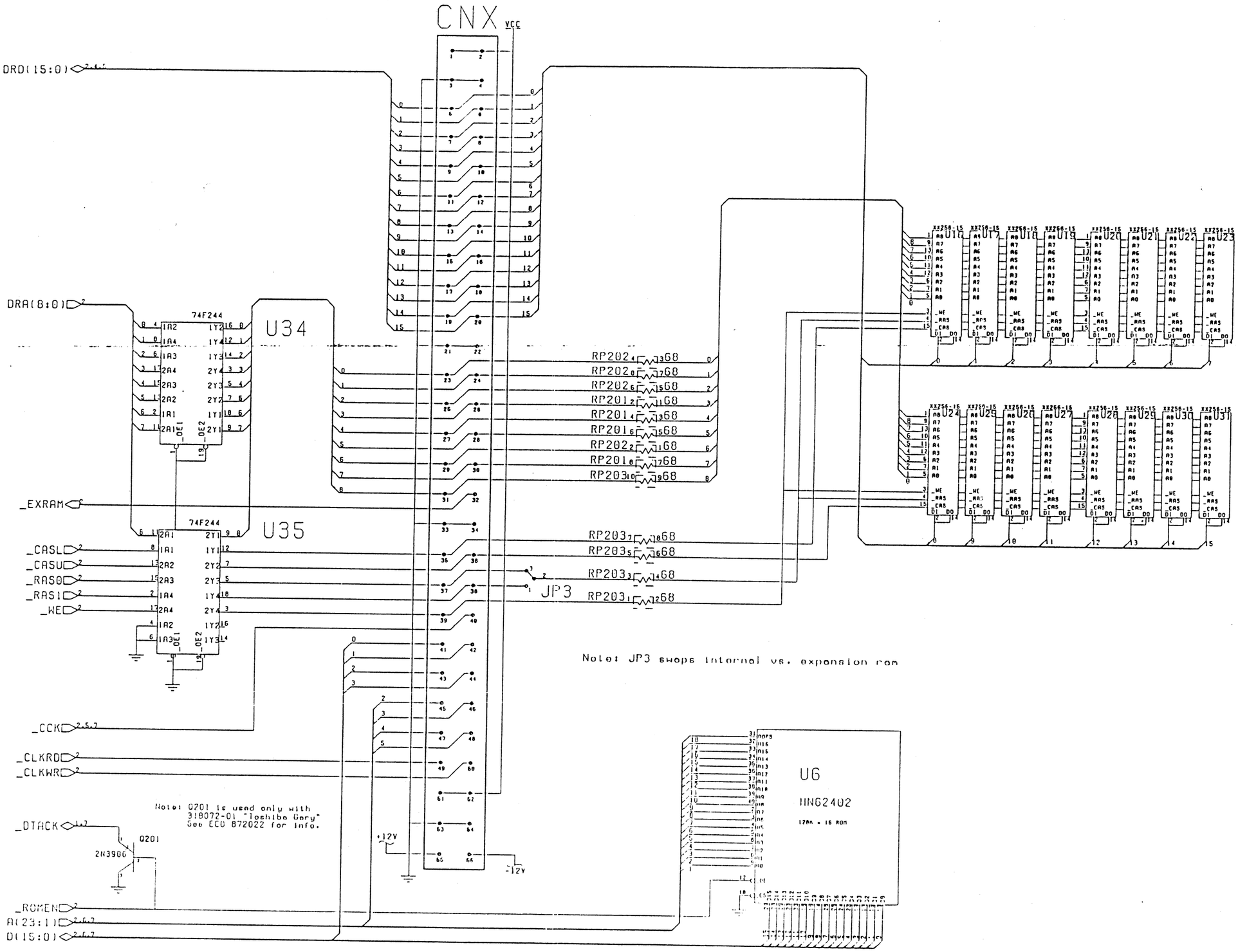
Sheet 2 of 9

Note: R103-104,106-108,C101 are for EMI Control and may be loaded with funny things...

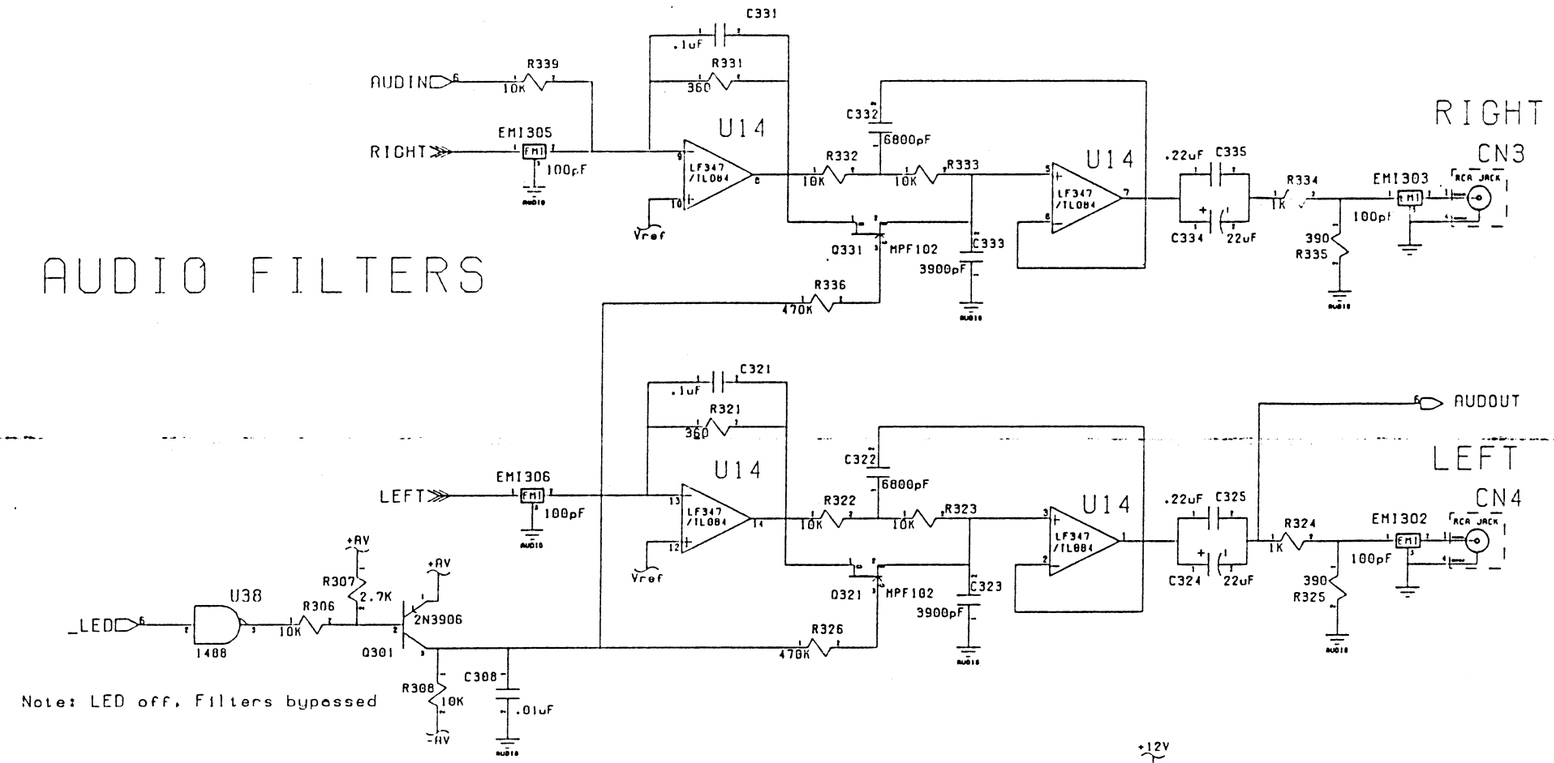
JP2 controls where expansion ram maps to:
A23 -> C00000 (default), A19 -> 080000

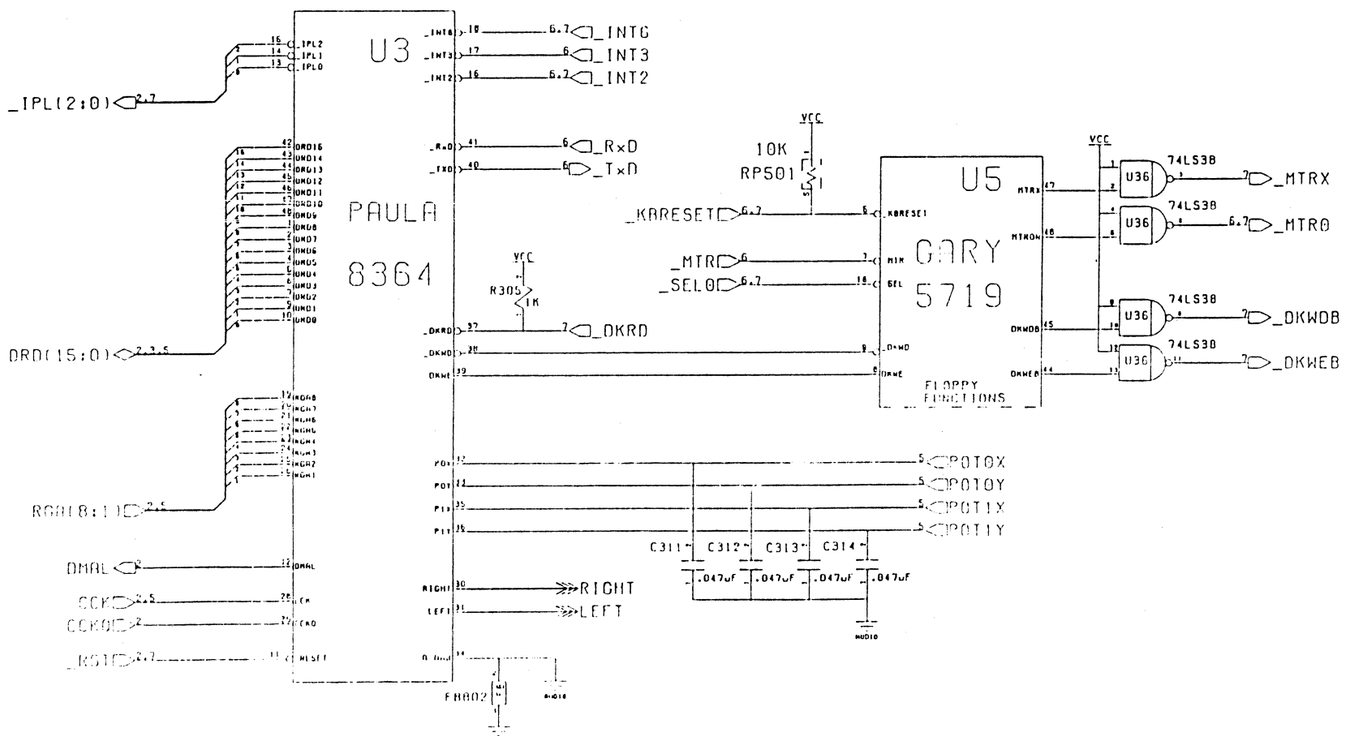
R109/C109,R105 Details, see ECO 880283
C101 FCC Filter Capacitor per ECO 870207

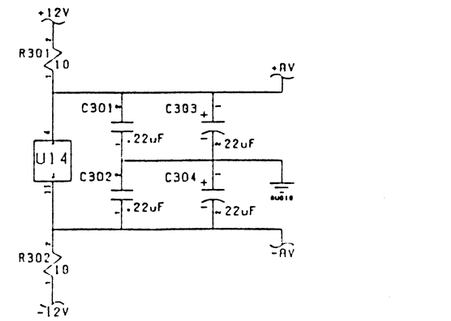



CNX
VCC
DRD(15:0)
DRA(8:0)
74F244
U34
U35
_EXRAM
_CASL
_CASU
_RAS0
_RAS1
_WE
_CCK
_CLKRD
_CLKWR
_DTACK
_ROMEN
A(23:1)
D(15:0)
Q201
2N3906
RP202 4 33Ω 0
RP202 0 47Ω 1
RP202 6 150Ω 2
RP201 2 110Ω 3
RP201 4 33Ω 4
RP201 6 150Ω 5
RP202 2 110Ω 6
RP201 8 47Ω 7
RP203 10 39Ω 8
RP203 7 18Ω
RP203 5 16Ω
RP203 3 14Ω
RP203 1 12Ω
JP3
+12V
-12V
U6
MMG2402
128K x 16 ROM
Note: JP3 swaps internal vs. expansion ram
Note: Q201 is used only with 318072-01 "Toshiba Gary" See ECO 872022 for info.

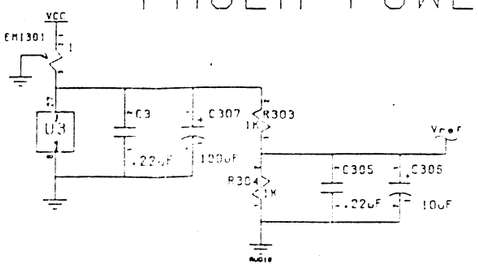
AUDIO FILTERS

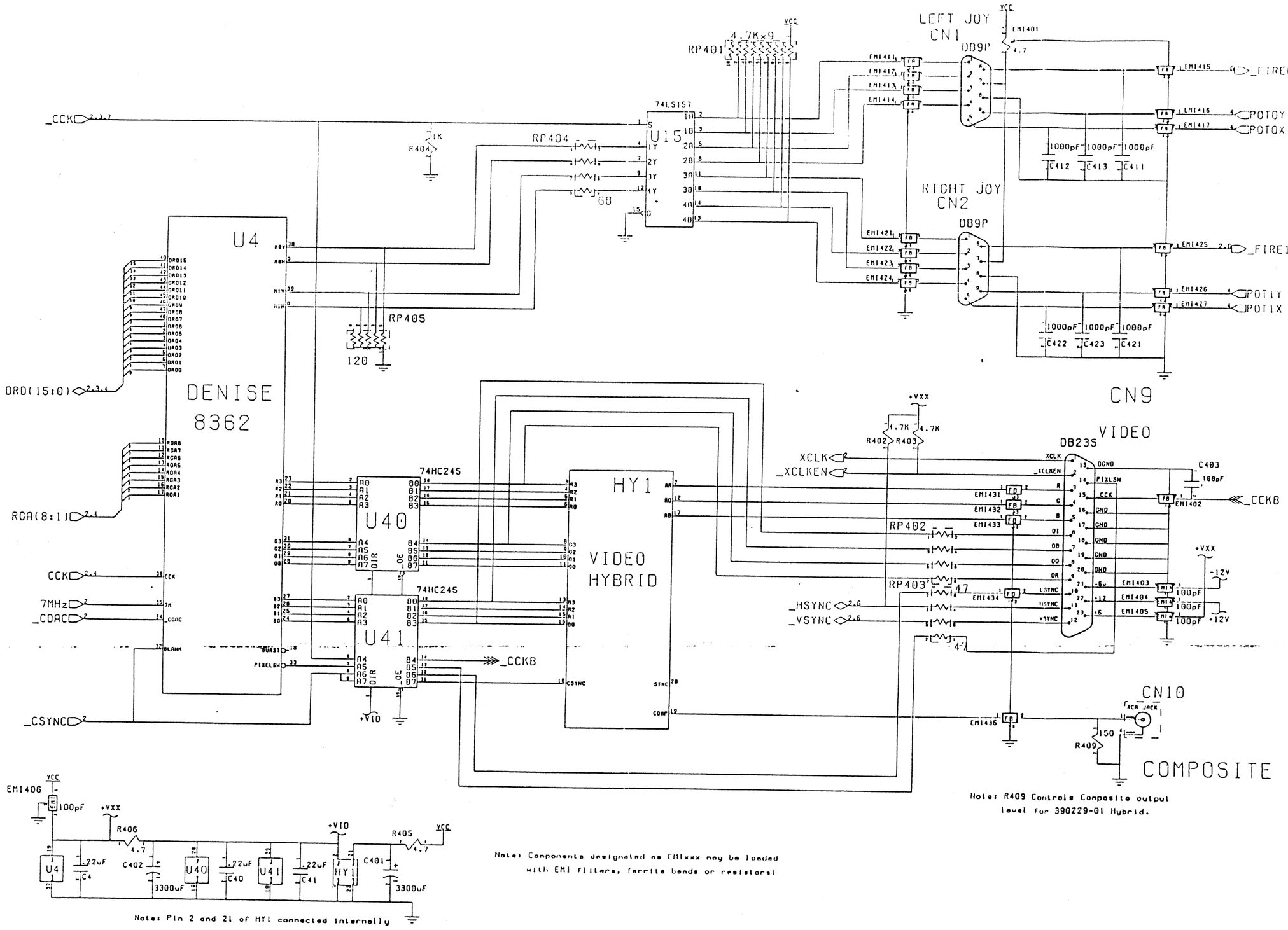






PAULA POWER!

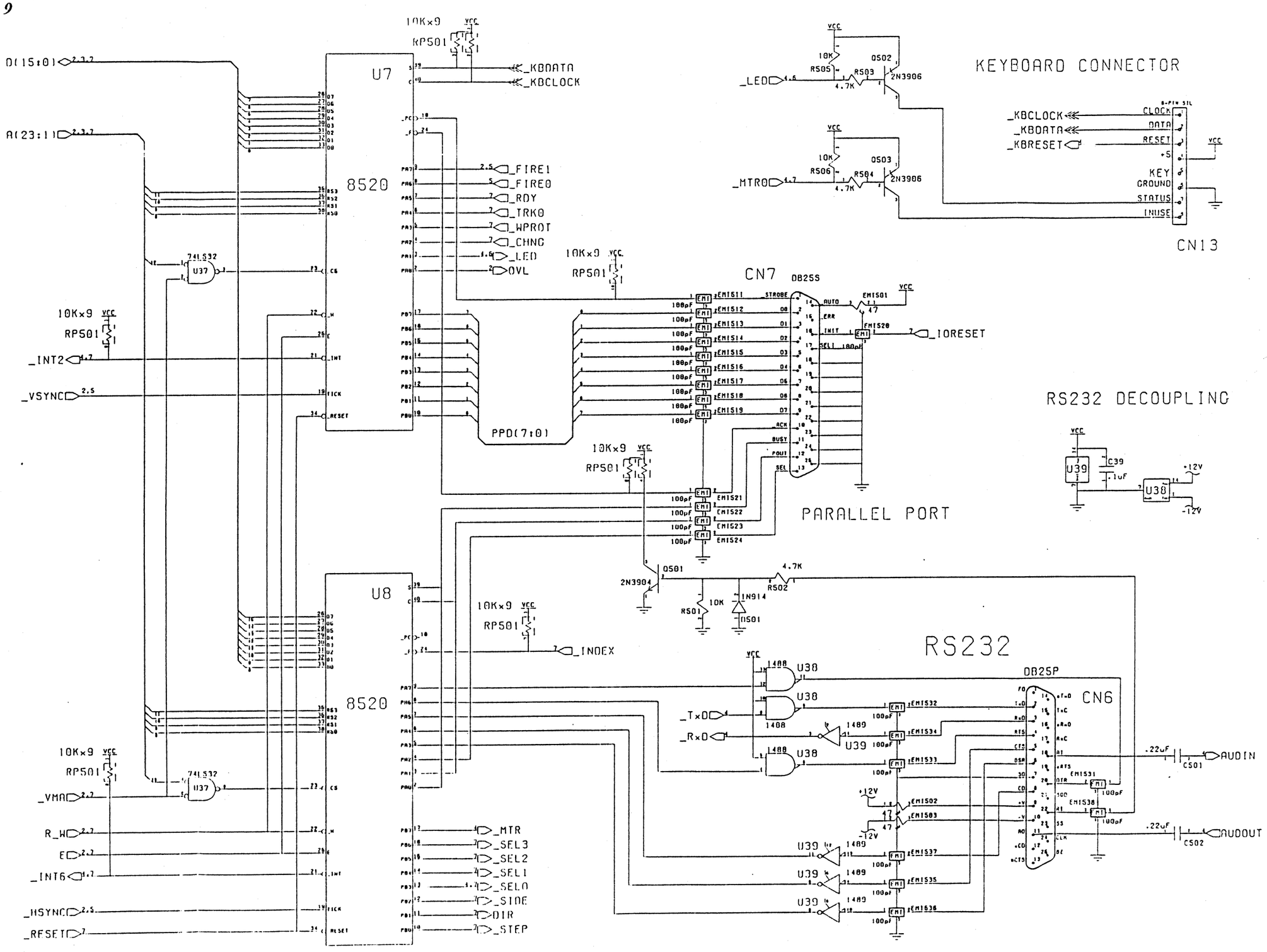


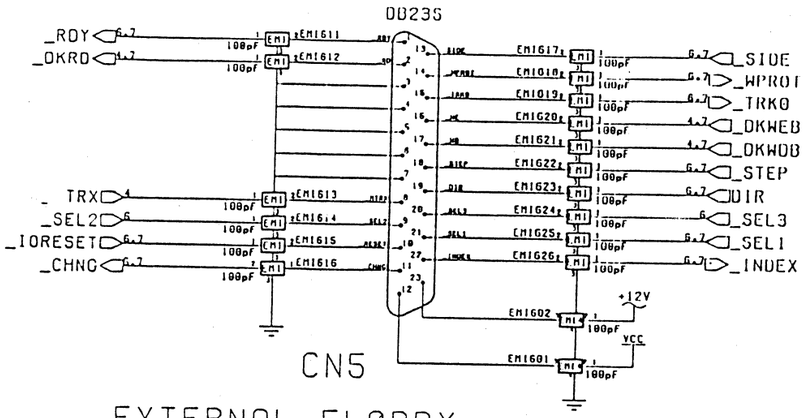


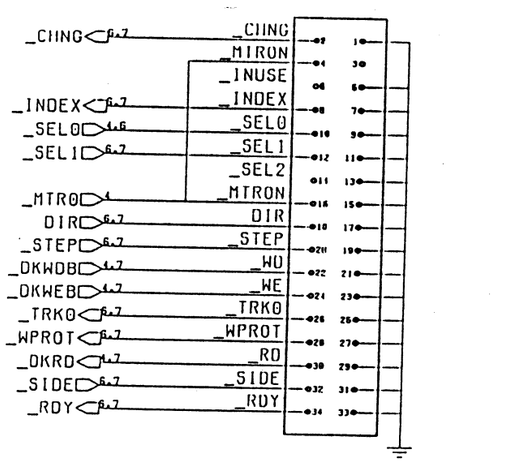
Note: Components designated as EMIxxx may be loaded with EMI filters, ferrite beads or resistors.

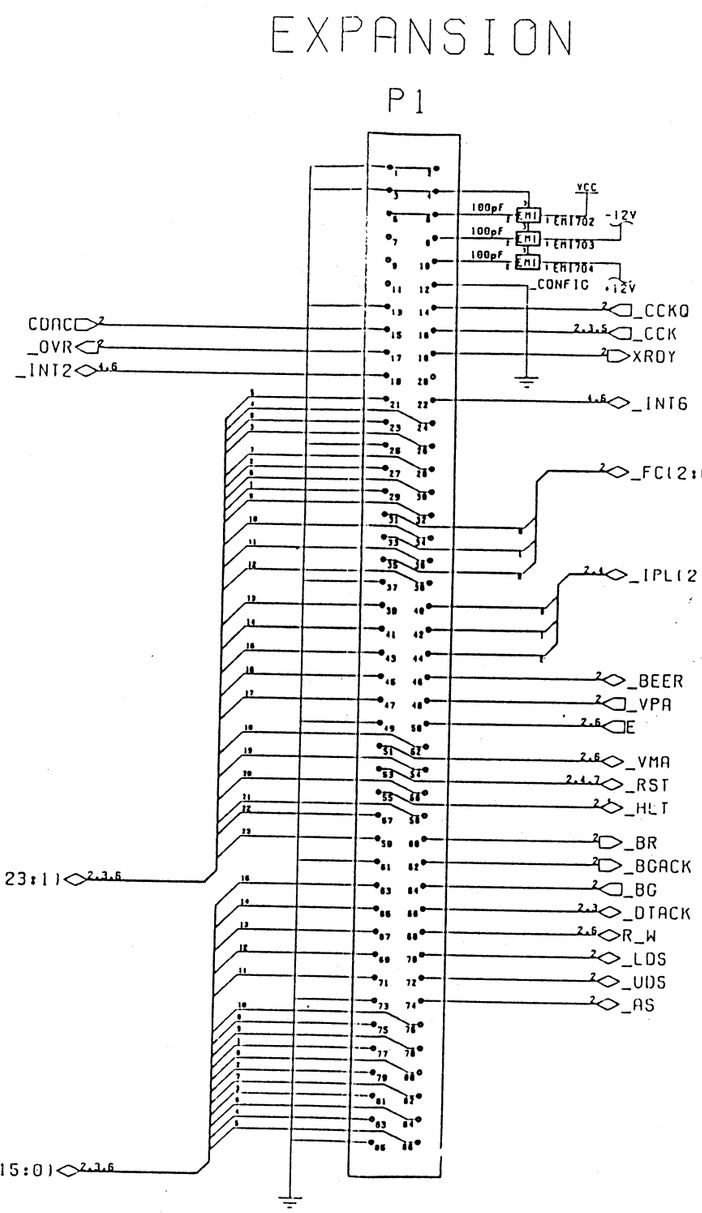
Note: Pin 2 and 21 of HY1 connected internally

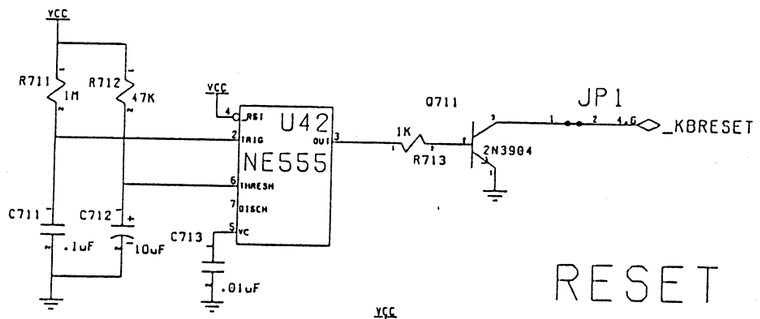
Note: R409 Controls Composite output level for 390229-01 Hybrid.

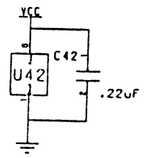

KEYBOARD CONNECTOR
CN13
RS232 DECOUPLING
PARALLEL PORT
RS232
CN7
CN6
U7
U8
8520
U37
U38
U39
RP501
10K×9
_KBDATA
_KBCLOCK
_FIRE1
_FIRE0
_RDY
_TRK0
_WPROT
_CHNG
_LED
_OVL
_INT2
_VSYNC
_INDEX
_MTR
_SEL3
_SEL2
_SEL1
_SEL0
_SIDE
DIR
_STEP
_VMA
R_W
E
_INT6
_HSYNC
_RESET
_TxD
_RxD
_IORESET
_AUDIN
_AUDOUT
PPD(7:0)
Note: EMI501-503 are loaded with 47 Ohm 1/2 W resistors



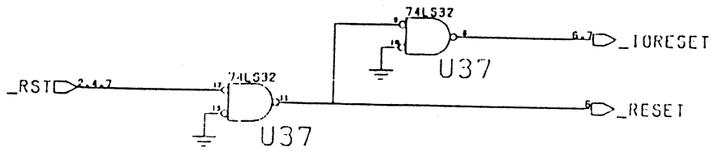




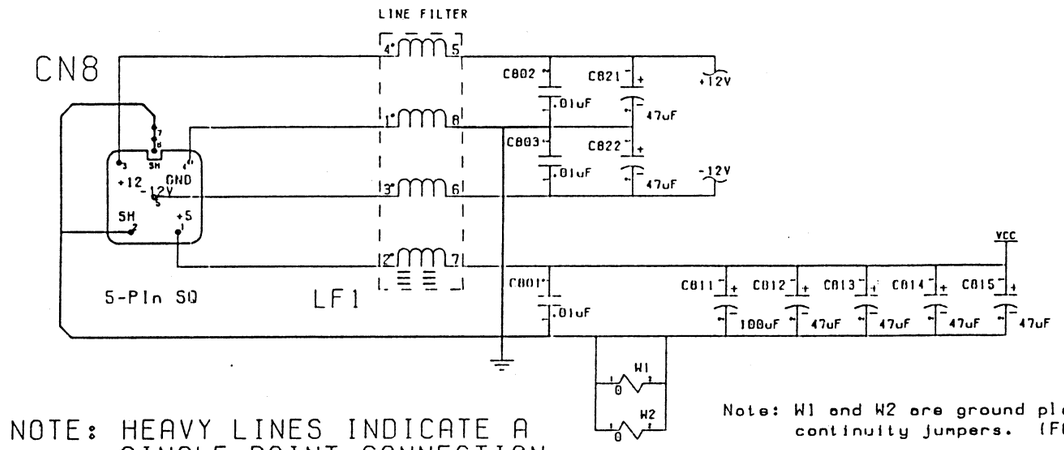




RESET ACTION



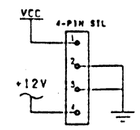
POWER INPUT



NOTE: HEAVY LINES INDICATE A SINGLE POINT CONNECTION

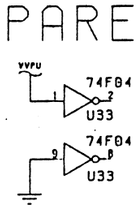
Note: W1 and W2 are ground plane continuity jumpers. (FCC)

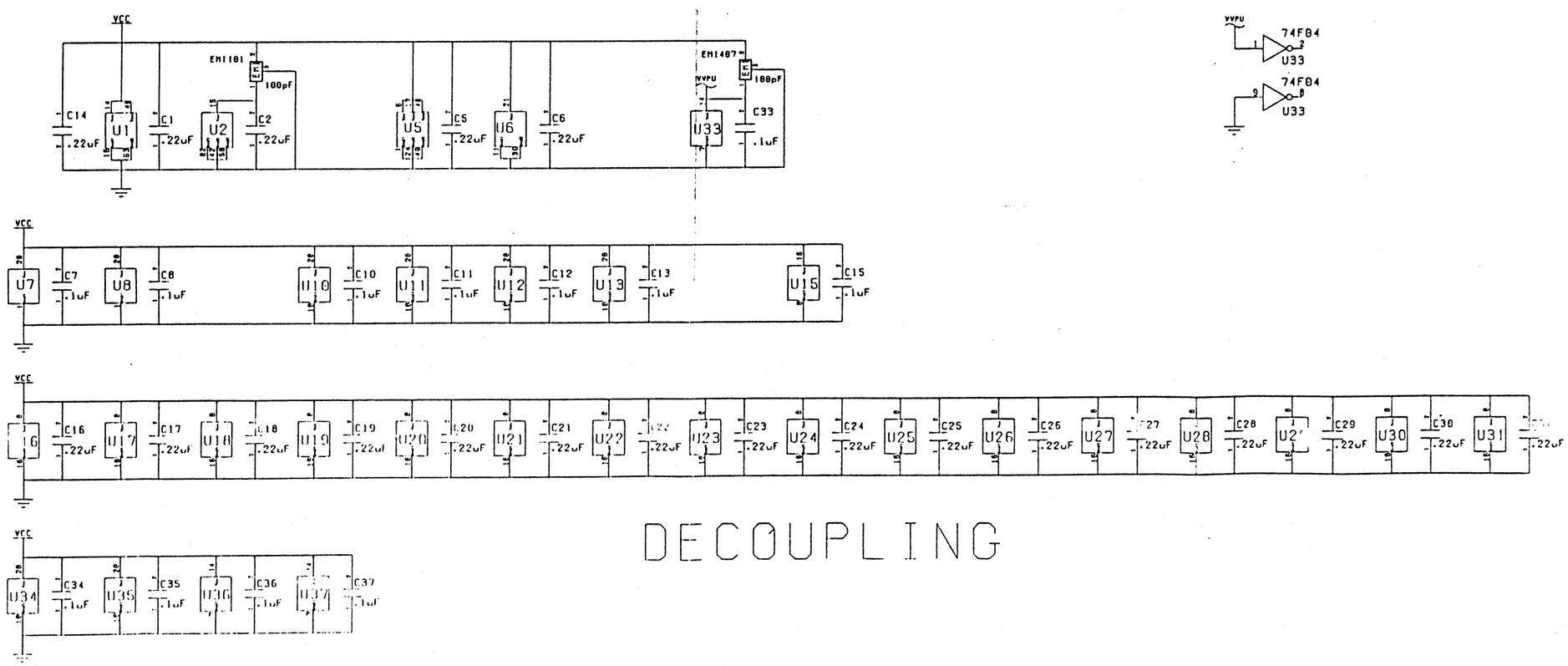
FLOPPY POWER



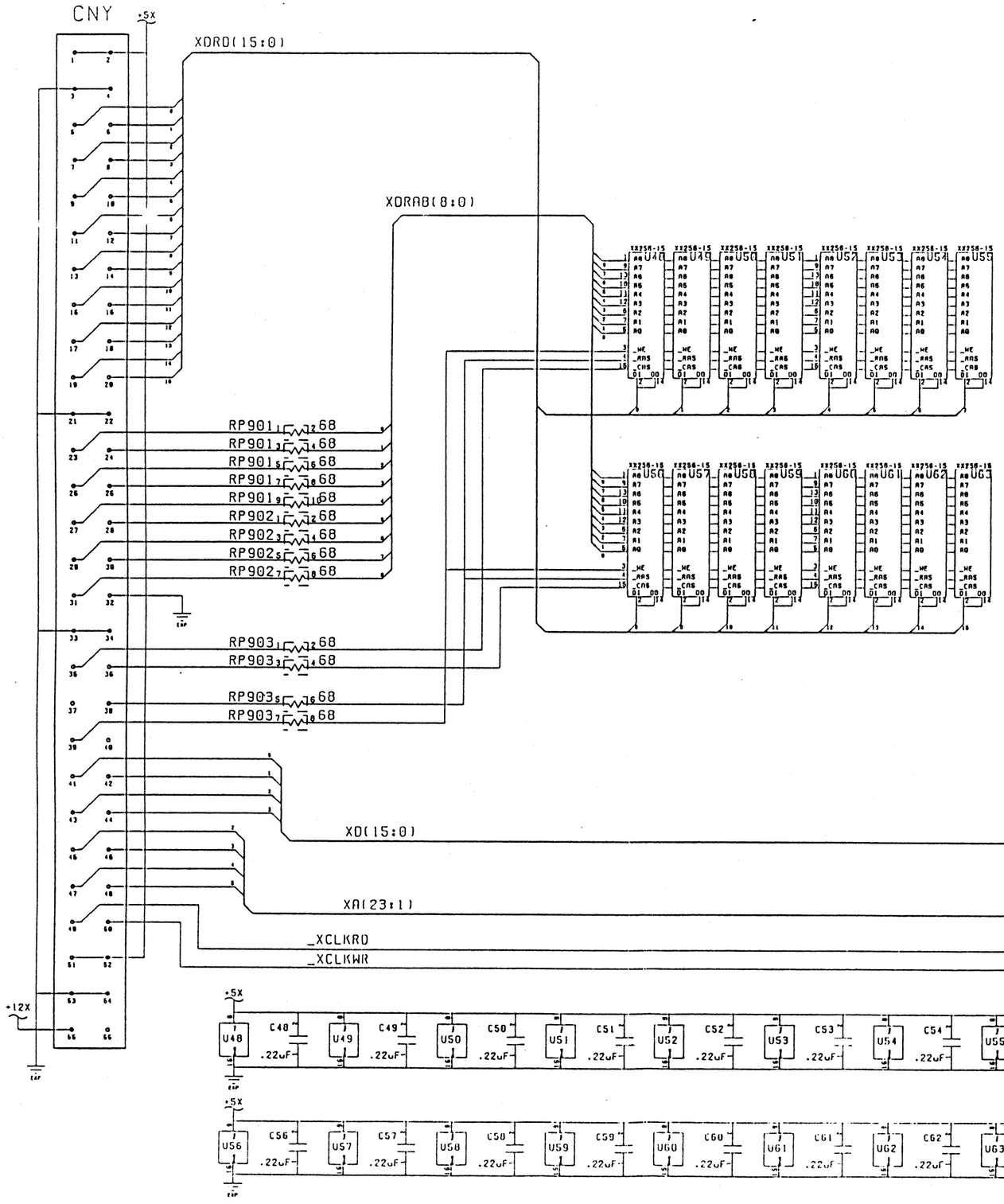
CN12

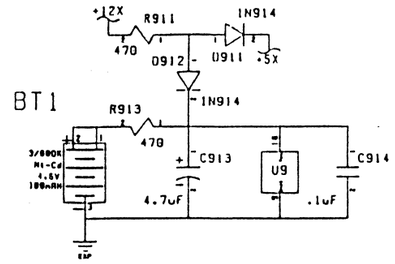
SPARES





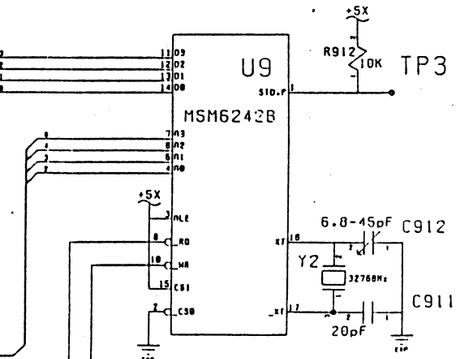
DECOUPLING

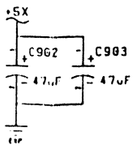




Real Time Power

Real Time Clock





COMPONENT PARTS LIST
PCB ASSEMBLY #312510, AMIGA A500, REV6A/7

312510-07 PCB ASSEMBLY, A500 NTSC 312510-08 PCB ASSEMBLY, A500 PAL

Commodore part numbers are provided for reference only and do not indicate the availability of parts from Commodore. Industry standard parts (Resistors, Capacitors, Connectors) should be secured locally. Approved cross-references for TTL chips, Transistors, etc. are available in manual form through the Service Department, order #314000-01.

IC COMPONENTS		
901882-01	INTERFACE MC1488	U38
901883-03	INTERFACE MC1489	U39
390086-01	LINEAR LF347/TL084	U14
901523-01	LINEAR NE555	U42
390084-03	MC68000 OMHz	U1
318072-01	MOS 5719 R2 GARY	U5
252126-02	MOS 8362 R8 DENISE	U4
252127-02	MOS 8364 R7 PAULA	U3
318069-02	MOS 8372 R3 AGNUS HR	U2
318029-02	MOS 8520 R4 AMIGA CIA	U7,U8
390110-01	TTL 74F04	U33
318050-01	TTL 74F244	U34,U35
310003-01	TTL 74HC245	U40,U41
901521-11	TTL 74LS157	U15
901521-13	TTL 74LS244	U10,U12
901521-31	TTL 74LS32	U37
901521-29	TTL 74LS373	U11,U13
901521-38	TTL 74LS38	U36
390229-01	VIDEO HYBRID	HY1
318070-01	MOS 8370 R3 FAT AGNUS (NTSC)	U2
318071-01	MOS 8371 R1 FAT AGNUS (PAL)	U2
390433-01	MOS 8373 R2 DENISE HR	U4
381099-04	DRAM 256K X 4 120 nS	U16-U19
381099-02	DRAM 256K X 4 100 nS	U16-U19
	NOT LOADED	U20-U23
395093-02	ROM 256K X 16 KICKSTART 1.3	U6
CAPACITORS		
900462-29	MLC AXIAL NOP 47pF	C403
900462-29	MLC AXIAL NOP 47pF	E102,E103,E106-3109
900462-29	MLC AXIAL NOP 47pF	XC1-XC3
900463-16	MLC AXIAL X7R 1000pF	C411-C413,C421-C423
900463-23	MLC AXIAL X7R 3900pF	C323,C333
900463-26	MLC AXIAL X7R 6800pF	C322,C332
900463-36	MLC AXIAL X7R .047pF	C311-C314
900463-37	MLC AXIAL X7R .1uF	C321,C331
390082-01	MLC AXIAL Z5U .01uF	C308,C713,C800-C803
390082-02	MLC AXIAL Z5U .1uF	C711
390082-04	MLC AXIAL Z5U .33uF	C1-C8,C10-C19,C33-C37,C39-C42,C301,C302,C305,C325,C335,C501,C502,C701,C804
	NOT LOADED	C20-C23
390101-06	ELECT ALUM RADIAL, 10uF 16V	C306,C712
390101-04	ELECT ALUM RADIAL, 22uF 35V	C303,C304,C324,C334
390101-01	ELECT ALUM RADIAL, 47uF 35V	C821,C822
390101-02	ELECT ALUM RADIAL, 100uF 16V	C811-C816
390101-03	ELECT ALUM RADIAL 470uF 16V	C307
900100-56	ELECT ALUM RADIAL 3300uF 10V	C401,C402
CONNECTORS		
325516-04	4PIN FLOPPY POWER	CN12
252167-01	5PIN SQ DIN	CN8
903335-08	8PIN SIL W/KEY	CN13
390241-03	D-SUB/23PIN/FEMALE/DB23S	CN5
390242-03	D-SUB/23PIN/MALE/DB23P	CN9
290241-05	D-SUB/25PIN/FEMALE/DE25S	CN7
290242-05	D-SUB/25PIN/MALE/DB25P	CN6
390242-01	D-SUB/9PIN/MALE/DB9P	CN1,CN2
350903-01	HEADER 34PIN W/KEY	CN11
390224-07	HEADER 56PIN MALE RA	CNX
252122-03	RCA JACK, YELLOW	CN10
252122-01	RCA JACK, WHITE	CN4
252122-04	RCA JACK, BLACK	CN3
903326-08	8PIN SIL W/KEY	CN13
903345-17	HEADER 34PIN W/KEY	CN11
390248-01	RCA JACK, METAL	CN10
390248-01	RCA JACK, METAL	CN3,CN4

DIODES		
900850-01	1N4148	D501
390017-01	1N914	D501
FILTERS		
251842-02	EMI FILTER, 100pF	E511-E519,E421-E524, E611-E626
390275-02	EMI FILTER, 150pF	E402,E434,E532,E534
390297-01	EMI FILTER, 270pF	E305,E306
390297-04	EMI FILTER, 470pF	E415-E417,E425-E427, E441-E444,E520,E531, E533,E535-E538
390275-01	EMI FILTER, 6800pF	E302,E303,E411-E414, E421-E424
390297-05	EMI FILTER .01uF	E101,E401,E403-E408, E601,E602,E702-E704
252173-01	FERRITE BEAD RADIAL	E431-E433,R435
251878-02	LINE FILTER	LF1
252133-01	LONG FERRITE BEAD	FB802
903025-01	FERRITE BEAD AXIAL	E431-E433,E435
TRANSISTORS		
390254-01	JFET MPF102/PN4302	Q321,Q331
902658-01	NPN 2N3904	Q501,Q711
902707-01	PNP 2N3906	Q301,Q502,Q503
RESISTORS		
901600-36	1/2W CF, 1	R309
901600-50	1/2W CF, 4.7	R401,R405,R406,R408
901600-15	1/2W CF, 47	E501-E503
901550-64	1/4W CF, 10	R301,R302
901550-90	1/4W CF, 27	R101,R102
901550-56	1/4W CF, 47	R103-R107,R113
901550-94	1/4W CF, 68	E104,E105
901550-94	1/4W CF, 68	R111,R112,R114
901550-94	1/4W CF, 68	XR1
901550-49	1/4W CF, 100	R507
901550-89	1/4W CF, 150	FB101
901550-89	1/4W CF, 150	R409
901550-108	1/4W CF, 360	R321,R331
901550-57	1/4W CF, 390	R325,R335
901550-01	1/4W CF, 1K	R303-R305,R324,R334, R713
901550-23	1/4W CF, 2.7K	R307,R502
901550-19	1/4W CF, 4.7K	R201,R202,R402,R403, R503,R504
901550-20	1/4W CF, 10K	R306,R308,R322,R323, R332,R333,R339,R501, R505,R506
901550-22	1/4W CF, 47K	R712
901550-82	1/4W CF, 470K	R326,R336
901550-84	1/4W CF, 1M	R711
902410-11	RES PACK SIP PULLUP, 470 X 9	RP104
902410-08	RES PACK SIP PULLUP, 4.7K X 9	RP101,RP102,RP401
902410-07	RES PACK SIP PULLUP, 10K X 9	RP501
390227-03	RES PACK SIP SERIES, 22 X 5	RP103
390227-05	RES PACK SIP SERIES, 68 X 5	RP201,RP203
390227-06	RES PACK SIP SERIES, 47 X 5	RP402,RP403
901600-129	RES 1/2W CF, 5.1	R401,R405,R406,R408
390227-08	RES PACK SIP SERIES, 39 X 5	RP103
	NOT LOADED	RP105-RP111,RP405
MISCELLANEOUS		
904150-06	SOCKET, 40PIN DIP	U6-U8
251313-01	SOCKET, 48PIN DIP	U3-U5
904150-10	SOCKET, 64PIN DIP	U1
390185-01	SOCKET, 84PIN PLCC	U2
251313-02	SOCKET, 48PIN DIP	U3-U5
252344-01	OSCILLATOR, 28.37516MHz (PAL)	X1
325566-14	OSCILLATOR, 28.63636MHz (NTSC)	X1
312511-03	SCHEMATIC	

Jumpers and Stuff

REF	TYPE	DESCRIPTION	PAGE
JP1	BLOB	Keyboard Reset	7
JP2	BLOB	Memory Addr. C0 vs 00	2
JP3	BLOB	Expansion RAS Select	3
JP4	BLOB	NTSC/PAL Selection	2
JP5	BLOB	Genlock Clock Select	2
JP6	BLOB	7MHz Clock Option	7
JP7	BLOB	Expansion/Tick Option	3/6
JP8	BLOB	Light Pen Port Select	6
JP10	BLOB	RS232 Audio I/O Cutout	4
JP11	BLOB	TTL vs RS170 Comp Sync	5

Connectors

REF	TYPE	DESCRIPTION	PAGE
CN1	DB9P	Mouse/Joystick 1	2
CN2	DB9P	Mouse/Joystick 2	2
CN3	RCA-J	Right Audio Output	4
CN4	RCA-J	Left Audio Output	4
CN5	DB23S	External Floppy	7
CN6	DB25P	RS232 Serial Port	6
CN7	DB25S	Parallel Printer Port	6
CN8	SQ DIN	Power Supply Connector	8
CN9	DB23P	Video Output	5
CN10	RCA-J	Composite Video	5
CN11	DIL-34	Internal Floppy Signal	7
CN12	SIL-4	Internal Floppy Power	8
CN13	SIL-8	Keyboard Connector	6
P1	EDGE86	Expansion Connector	7
CNX	RA-56H	Mem. Exp. Main-Board	3

ECO Log

ECO NUMBER	DESCRIPTION	DATE
88G283	Add E Clock Termination	03/03/89

Signal Glossary

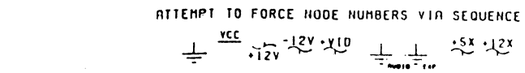
SIGNAL	DESCRIPTION (AREA)	PAGES
28MHZ	28.63636 MHz Master Clock	2
7MHZ	7.15909 MHz Processor Clock	2,5
A[23:1]	Processor Address Bus (68000)	2,3,7
ACK	Data Acknowledge (Parallel Port)	6
AS	Address Strobe (68000)	2,7
AUDIN	Audio Input (RS232 Port)	4,6
AUDOUT	Audio Output (RS232 Jack)	4,6
BERR	Bus Error (68000)	2,7
BG	Bus Grant (68000)	2,7
BGACK	Bus Grant Acknowledge (68000)	2,7
BLISS	Blitter Slowdown (Chips)	2
BLIT	Chip Memory Access (Chips)	2,7
BR	Bus Request (68000)	2,7
BUSY	Device Busy (Parallel Port)	6
CASL/U	Column Address Strobe (DRAM)	2,3
CCK/CCKQ	Color Clock / Quadrature (Chips)	2,4,7
CDAC	7.15909 MHz Quadrature Clock (Chips)	2,5,7
CHNG	Media Change (Floppy)	6,7
CLKRD/WR	Real-Time Clock Read / Write (RTC)	2,9
COMP	Monochrome Composite Video (Video)	5
CSYNC	Composite Sync (Video)	2,5
CTS	Clear to Send (RS232 Port)	6
D[15:0]	Processor Data Bus (68000)	2,3,6,7
DIR	Step Direction (Floppy)	6,7
DKRD	Disk Read Data (Floppy)	4,7
DKWD	Disk Write Data (Floppy)	4,7
DKWE	Disk Write Enable (Floppy)	4,7
DMAL	Chip DMA Request Line (Chips)	2,4
DRA[8:0]	DRAM Address Bus (DRAM)	2,3
DRD[15:0]	DRAM Data Bus (DRAM)	2,3,4,5
DSR	Data Set Ready (RS232 Port)	6
DTACK	Data Transfer Acknowledge (68000)	2,3,7
DTR	Data Terminal Ready (RS232 Port)	6
E	Peripheral Enable Clock (68000)	2,6,7
EXTICK	Expansion Present / RTC Tick	2,3
FC[2:0]	Function Code (68000)	2,7
FIRE0/1	Fire Button 0/1 (Joysticks)	2,5,6
HLT	Processor Halt (68000)	2,7
HSYNC	Horizontal Sync (Video)	2,5,6
INDEX	Index Pulse (Floppy)	6,7
INT[2,3,6]	Interrupt Request (Chips)	2,4,6,7
IORESET	I/O Reset	6,7
IPL[2:0]	Interrupt Priority Level (68000)	2,4,7
KBCLOCK	Keyboard Clock (Keyboard)	6
KBDATA	Keyboard Data (Keyboard)	6
KBRESET	Keyboard Reset (Keyboard)	6
LDS/UDS	Upper / Lower Data Strobes (68000)	2,7
LED	Power On LED / Audio Filter Disable	4,6
LEFT/RIGHT	Left Right Audio (Audio)	4

SIGNAL	DESCRIPTION (AREA)	PAGES
LPEN	Light Pen Trigger (Joysticks)	2,6
MIR	Motor On (Floppy)	4,6
MIR0	Motor On - Drive 0 (Floppy)	4,6,7
M0V/M0H	Mouse 0 Quadrature V/H (Joysticks)	5
M1V/M1H	Mouse 1 Quadrature V/H (Joysticks)	5
OVL	Overlay ROM over RAM	2,6
OVR	Override System Decoding	2,7
PIXELSW	Genlock Pixel Switch (Video)	5
POT0X/0Y	Pot Lines 0 X/Y (Joysticks)	4,5
POT1X/1Y	Pot Lines 1 X/Y (Joysticks)	4,5
POUT	Paper Out (Parallel Port)	6
PPD[7:0]	Parallel Port Data (Parallel Port)	6
RAMEN	RAM Enable (Chips)	2
REGEN	Chip Register Enable (Chips)	2
RAS0/1	Row Address Strobe (DRAM)	2,3
RDY	Drive Ready (Floppy)	6,7
RESET	General Reset	6,7
RGA[8:1]	Register Address Bus (Chips)	2,4,5
R/G/B	Red / Green / Blue (Video)	5
RI	Ring Indicate (RS232 Port)	6
ROMEN	ROM Enable (ROM)	2,3
RTS	Request to Send (RS232 Port)	6
RST	Processor Reset (68000)	2,4,7
RXD	Receive Data (RS232 Port)	4,6
RW	Processor Read/Write (68000)	2,6,7
SEL	Select (Parallel Port)	6
SEL[3:0]	Drive Select (Floppy)	4,6,7
SIDE	Side Select (Floppy)	6,7
STEP	Step In/Out Command (Floppy)	6,7
TRK0	Track Zero Sense (Floppy)	6,7
TXD	Transmit Data (RS232 Port)	4,6
VMA	Valid Memory Address (68000)	2,6,7
VPA	Valid Peripheral Address (68000)	2,7
VSYNC	Vertical Sync (Video)	2,5,6
WE	Write Enable (DRAM)	2,3
WPROT	Write Protect Sense (Floppy)	6,7
XCLK	External Genlock Clock (Video)	2,5
XCLKEN	External Clock Enable (Video)	2,5
XRDY	External Data Ready	2,5

Key Components

REF	CHIP	DESCRIPTION	PAGE
U1	68000	68000 Processor	2
U2	8370	Fat Agnus - NTSC	2
	8371	Fat Agnus - PAL	alt
	8372	Agnus HR	alt
U3	8364	Paula	4
U4	8362	Denise	5
	8373	Denise HR	alt
U5	5719	Gary	2,4
U6	assl	ROM 128Kx16, 200 nS	3
U7-8	8520	Amiga VIA, 1 MHz	6
U14	LF347	BiMOS Op-Amp	4
	TL084	BiMOS Op-Amp	alt
U38	1488	EIA Line Driver	4
U39	1489	EIA Line Receiver	4
U42	NE555	Timer	7
U16-19	assl	DRAM 1Mx1, 150 nS	3
U20-23	assl	DRAM 1Mx1, 150 nS	9
X1	OSC	TTL 28.63636 MHz NTSC	2
	OSC	TTL 28.37512 MHz PAL	alt
UY1	assl	Video Hybrid	5

ATTEMPT TO FORCE NODE NUMBERS VIA SEQUENCE



Note: Various components are for EMI Control
and may be loaded with funny things...

JP2 controls where expansion ram maps to:
A23 -> C00000 (default), A19 -> 080000

XR1 is added to some boards per ECO 880283

U1
MC68000

U5
5719
GARY

U2
8372
Agnus HR

FLOPPY FUNCTIONS
CONTROL FUNCTIONS

JP2

U12
U13
U10
U11
74LS244
74LS373

RP104 470x7
RP102 4.7Kx9
RP101 4.7Kx9
RP104 470x7

XR1 68
E103 47pF
E106 47pF
E107 47pF
E108 47pF
E104 68
E105 68

R113 47
R112 68
R111 68
R102 27
R101 27
R114 68
R103 47
R104 47
R105 47
R107 47
R105 47

U33 74F04 RP103 39

X1 28.63636MHz OSCILLATOR
FB101 150
JP5
JP4

SPARE RP103 39

Note: PAL uses 28.37516 MHz

SYSTEM SCHEMATICS

A500

REVISIONS 5, 6A, 7

INCLUDES A501 REV 6C

AUGUST, 1989 **PN-314981-02**

INTERNATIONAL EDITION

COMMODORE "INTERNATIONAL EDITION" SERVICE MANUALS CONTAIN PART NUMBER INFORMATION WHICH MAY VARY ACCORDING TO COUNTRY. SOME PARTS MAY NOT BE AVAILABLE IN ALL COUNTRIES.

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A 500

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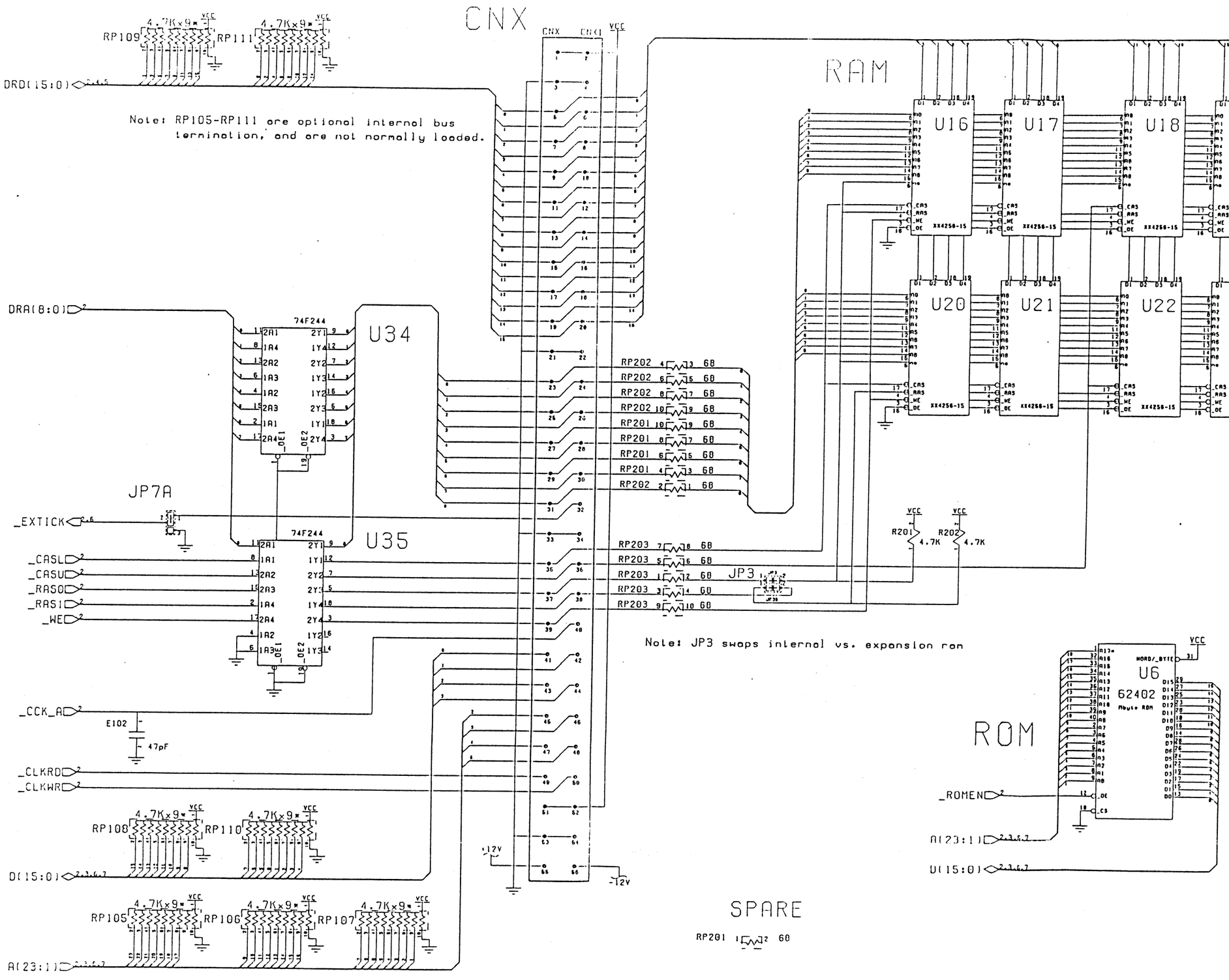
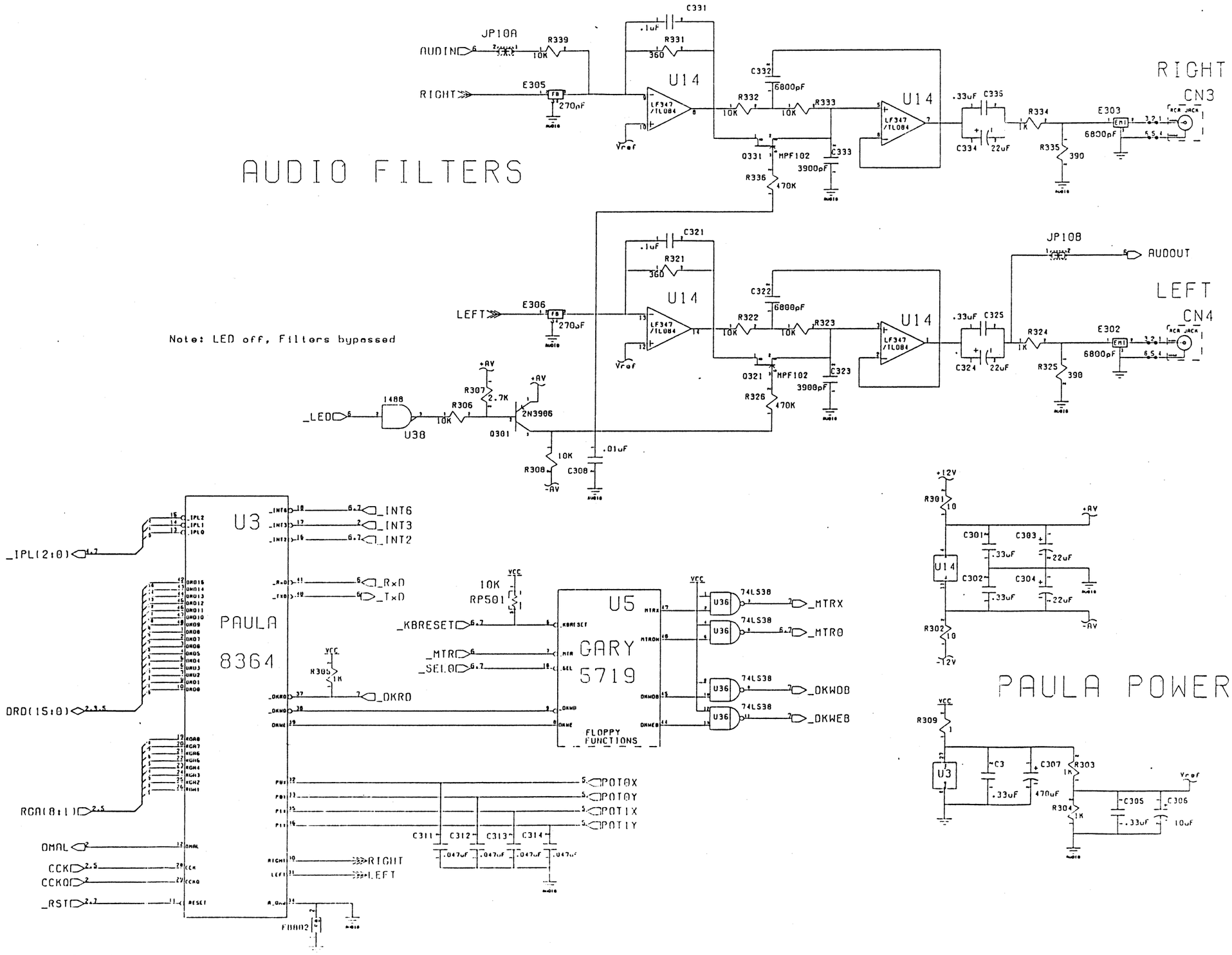

CNX
RAM
ROM
SPARE
U16
U17
U18
U19
U20
U21
U22
U23
U34
U35
U6
74F244
JP7A
JP3
RP108
RP109
RP110
RP111
RP105
RP106
RP107
RP201
RP202
RP203
R201
R202
4.7K
4.7Kx9
68
60
E102
47pF
DRD(15:0)
DRA(8:0)
A(23:1)
D(15:0)
_EXTICK
_CASL
_CASU
_RASO
_RASI
_WE
_CCK_A
_CLKRD
_CLKWR
_ROMEN
+12V
-12V
VCC
Note: RP105-RP111 are optional internal bus termination, and are not normally loaded.
Note: JP3 swaps internal vs. expansion ram

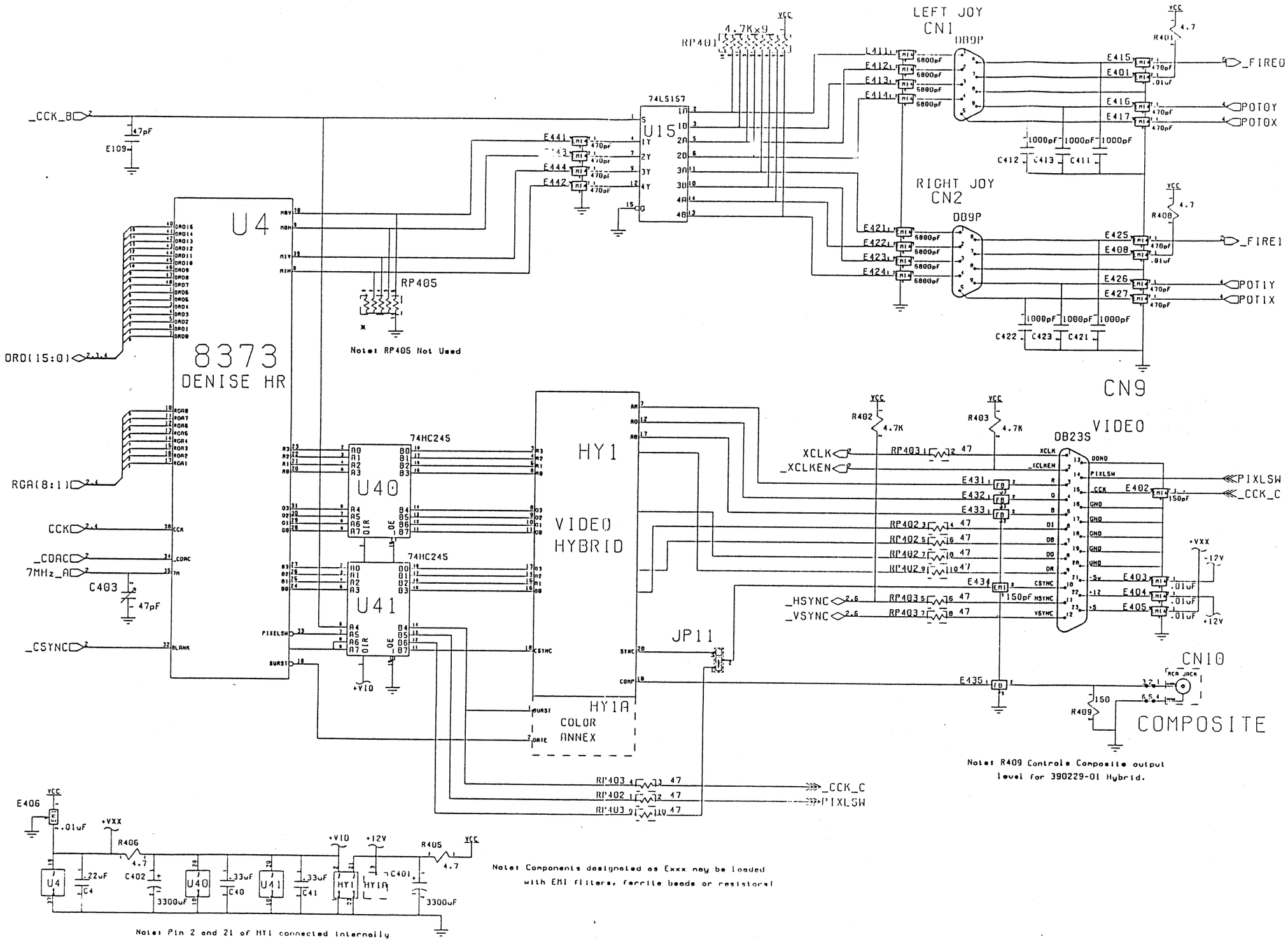
AUDIO FILTERS

Note: LED off, Filters bypassed



Note: Ground interconnection near audio jacks.

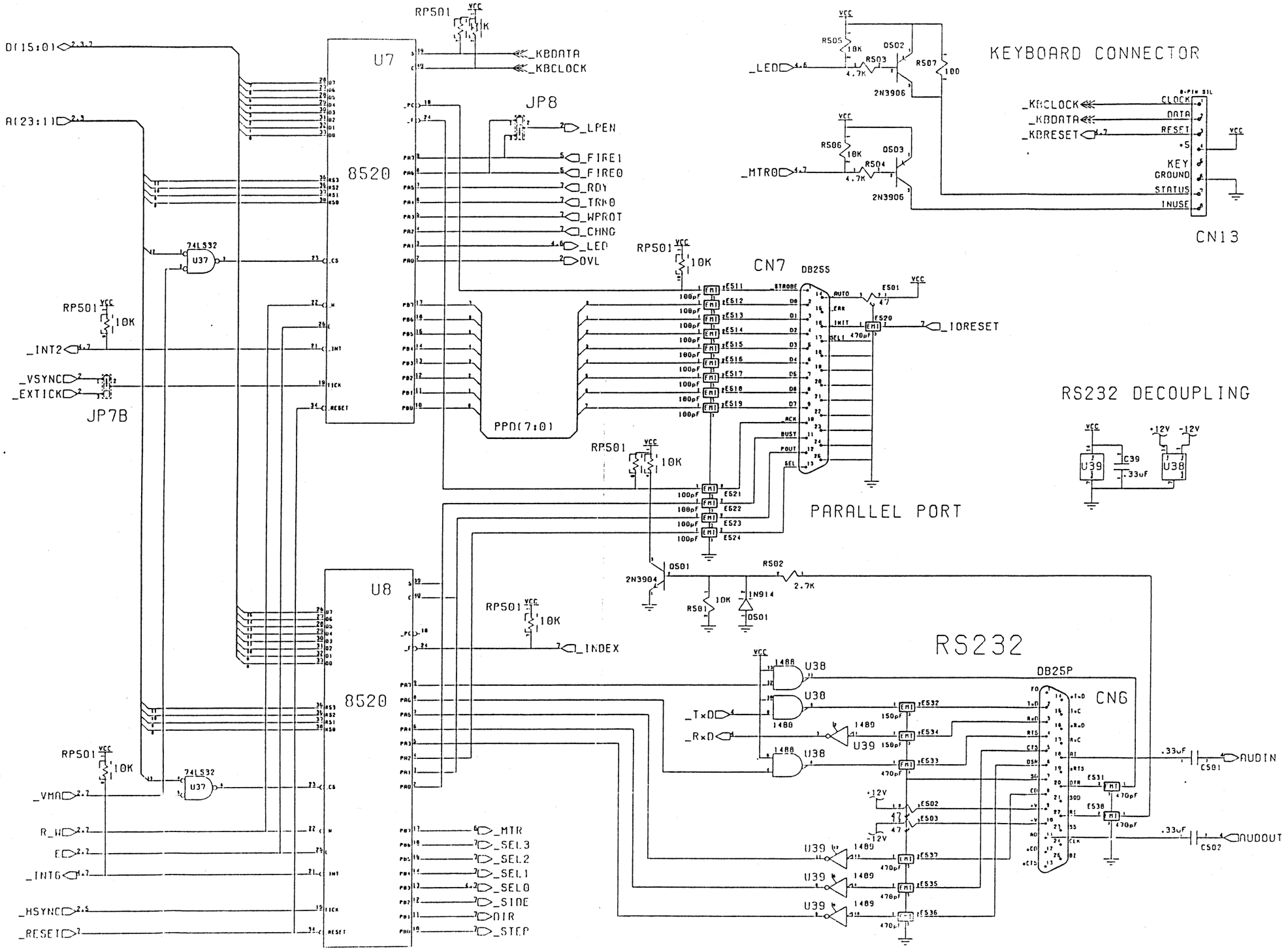
PAULA POWER!



Note: R409 Controls Composite output level for 390229-01 Hybrid.

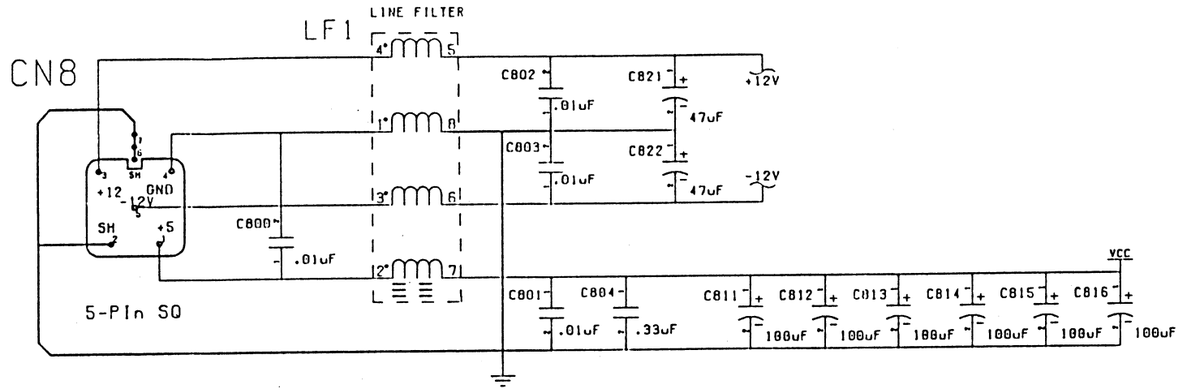
Note: Components designated as Exxx may be loaded with EMI filters, ferrite beads or resistors!

Note: Pin 2 and 21 of HY1 connected internally

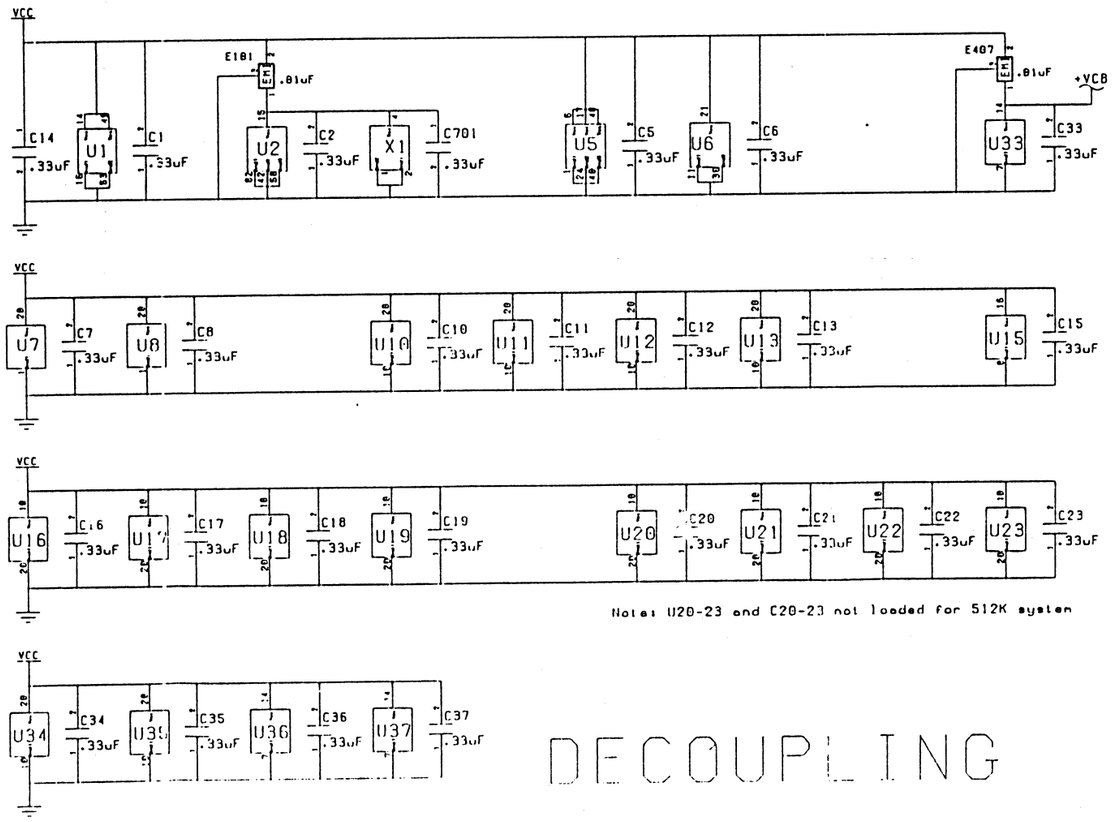


Note: E501-503 are loaded with 47 Ohm 1/2 W resistors

POWER INPUT



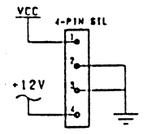
NOTE: HEAVY LINES INDICATE A SINGLE POINT CONNECTION



Note: U20-23 and C20-23 not loaded for 512K system

DECOUPLING

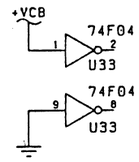
FLOPPY POWER



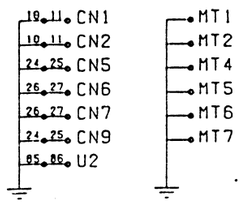
CN12

Note: Some drives are +5 only...

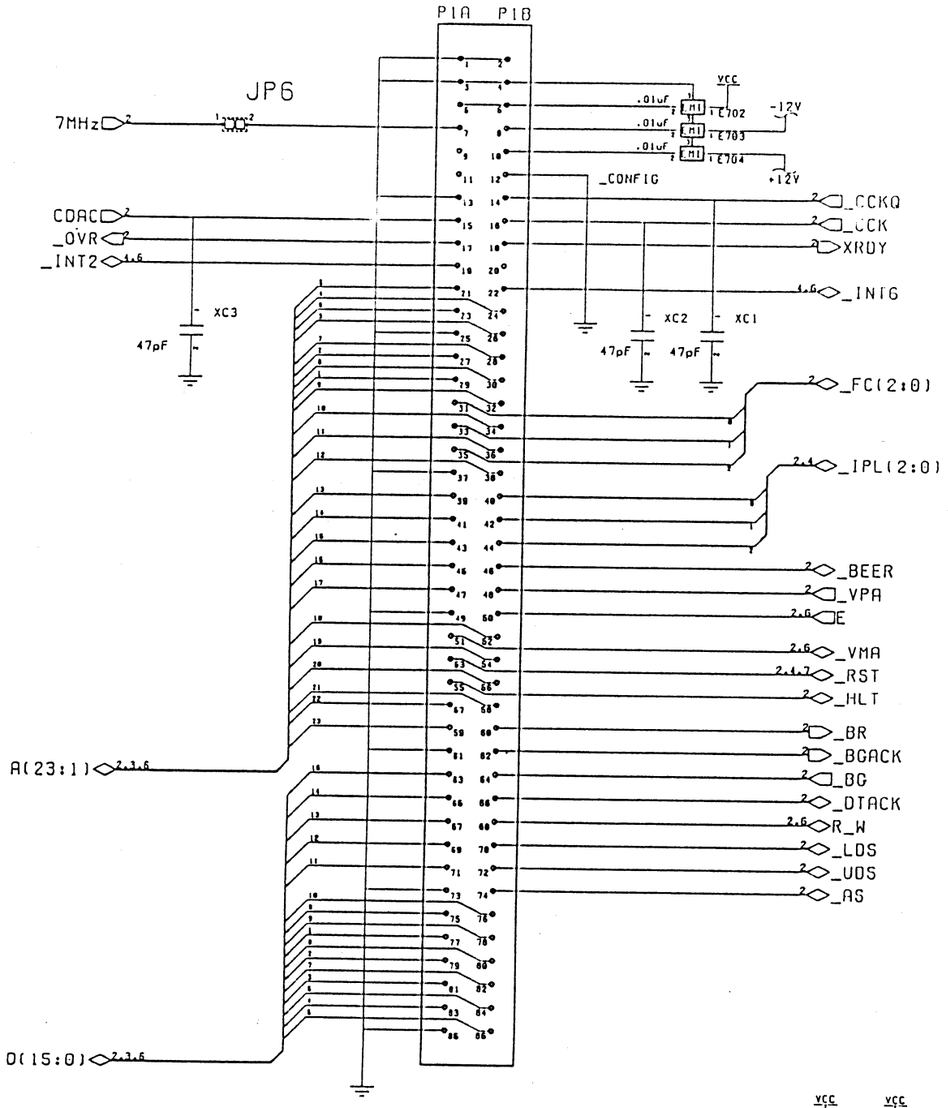
SPARES



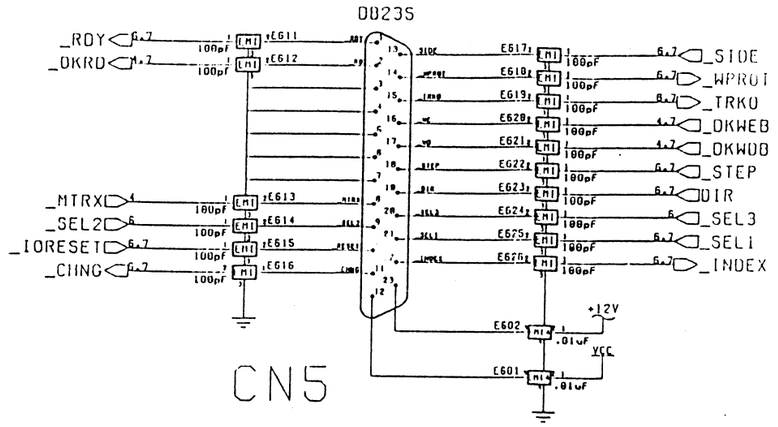
GROUNDED HOLES, &c.



EXPANSION P1

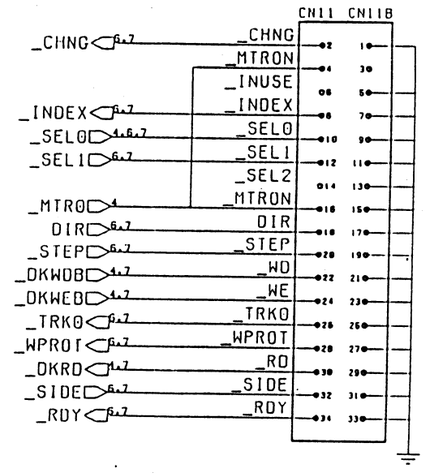


CN5



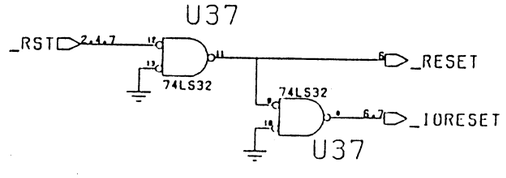
EXTERNAL FLOPPY

CN11

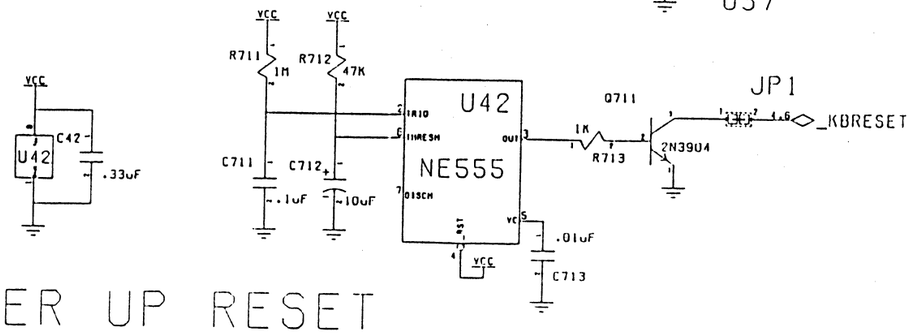


INTERNAL FLOPPY

U37



POWER UP RESET



COMPONENT PARTS LIST
PCB ASSEMBLY RAM EXPANSION/CLOCK
PCB ASSEMBLY #312604-04, A501, REV. 6C

Commodore part numbers are provided for reference only and do not indicate the availability of parts from Commodore. Industry standard parts (Resistors, Capacitors, Connectors) should be secured locally. Approved cross-references for TTL chips, Transistors, etc. are available in manual form through the Service Department, order #314000-01.

IC COMPONENTS		
318099-04	DRAM 256K X 4 120nS	U1-U4
318099-02	DRAM 256K X 4 100nS	U1-U4
318073-01	OKI MSM6242B REAL TIME CLOCK	U9
390392-01	TTL 74F27 TRIPLE 3-IN NOR	U13
390198-01	TTL 74F86 QUAD 2-IN XOR	U12
901521-33	TTL 74LS163 BINARY COUNTER	U11
RESISTORS		
901550-58	1/4W CF, 470	R911,R913
901550-20	1/4W CF, 10K	R912,R914,R915
390227-05	RES PACK SIP SERIES, 68 X 5	RP901-RP903,RP911
	NOT LOADED	RP912
CAPACITORS		
900462-21	MLC AXIAL NPO 22pF	C911
390082-01	MLC AXIAL Z5U .1uF	C9
390082-04	MLC AXIAL Z5U .33uF	C1-C4,C11-C13
251029-06	TRIMMER (YELLOW) 6.8-45pF	TC9
	NOT LOADED	C10
390101-02	ELECT ALUM RADIAL 100uF 16V	C902,C903
900410-13	ELECT TANTALUM RADIAL 4.7uF 16V	C913
390101-05	ELECT ALUM RADIAL 4.7uF 16V	C913

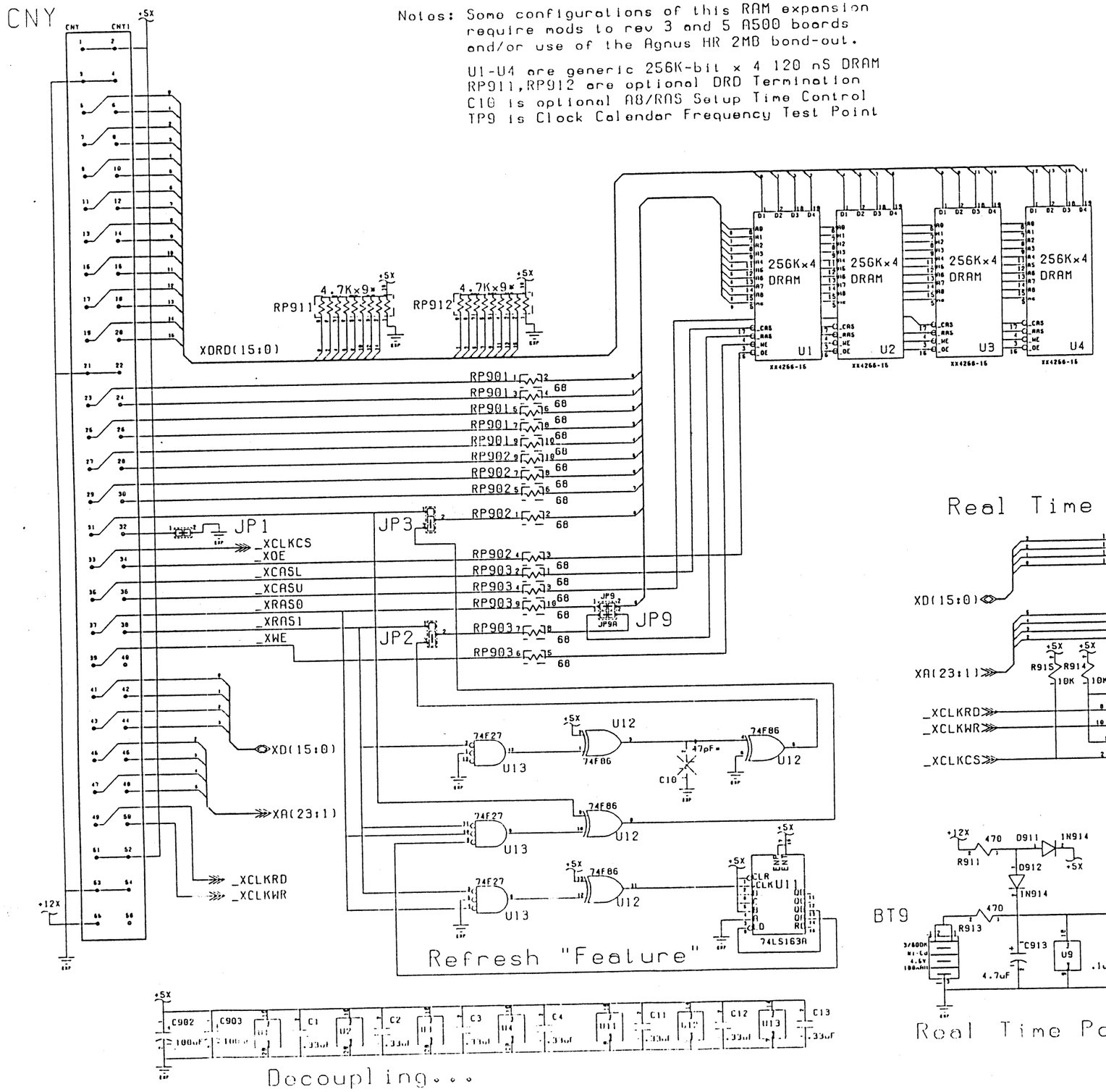
CONNECTORS		
380311-05	HEADER 56PIN FEMALE RA	CNY
DIODES		
900850-01	SWITCHING 1N4148	D912
390017-01	SWITCHING 1N914	D911
MISCELLANEOUS		
380393-01	BATTERY NICD VARTA 3/60DK, 3.6V 60MAH	BT9
900560-01	CRYSTAL WATCH STYLE, 32768Hz	Y9
312606-03	FABRICATION DRAWING	
312578-03	PCB ARTWORK	
312605-03	SCHEMATIC	

Schematic #312605-01, Rev. 6C

Sheet 1 of 1

Notes: Some configurations of this RAM expansion require mods to rev 3 and 5 A500 boards and/or use of the Agnus HR 2MB bond-out.

U1-U4 are generic 256K-bit x 4 120 nS DRAM
RP911,RP912 are optional DRD Termination
C10 is optional A8/RAS Setup Time Control
TP9 is Clock Calendar Frequency Test Point



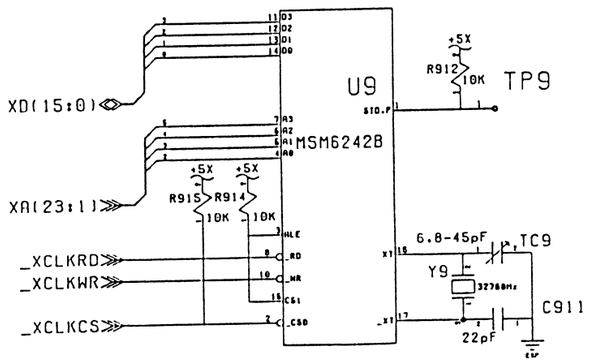
ECO History

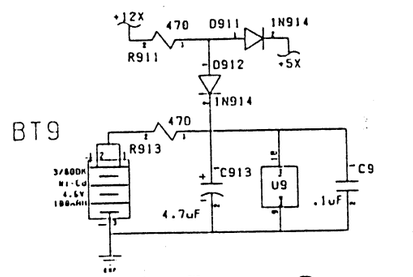
ECO NUMBER	DESCRIPTION	DATE

Configuration Options

	A	B
on-board	512K	2M
on A501	512K	-
U1-U4	256K×4	1M×4
Agnus	Fat/HR	HR (2M)
JP1	1-2	-
JP9	1-2,1-2	1-1,2-2

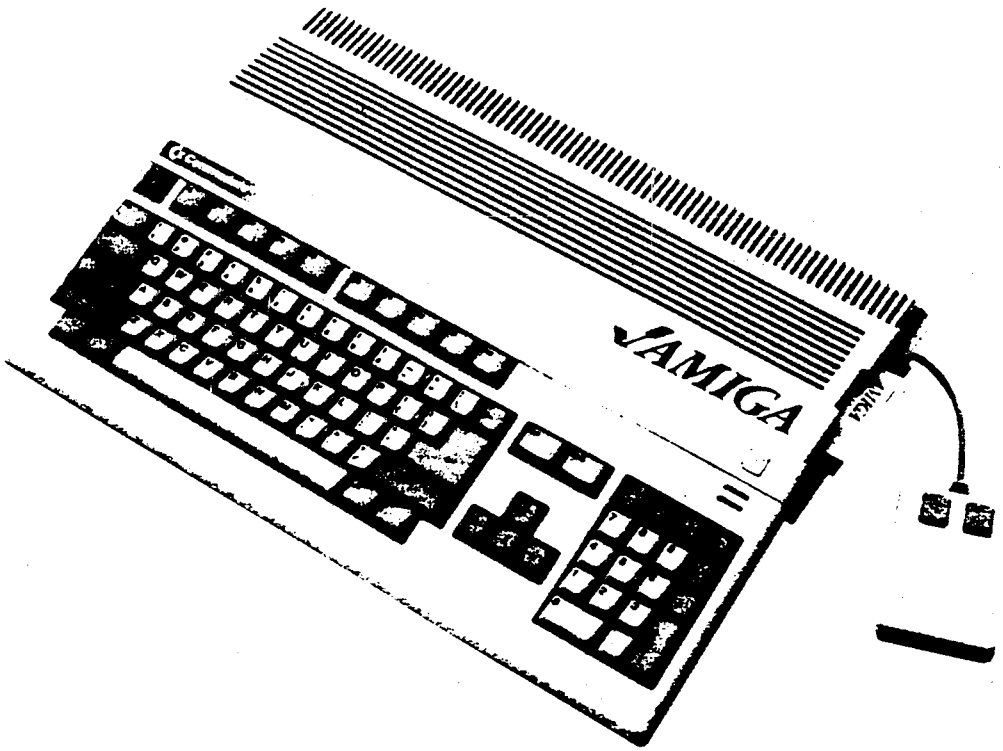
Real Time Clock

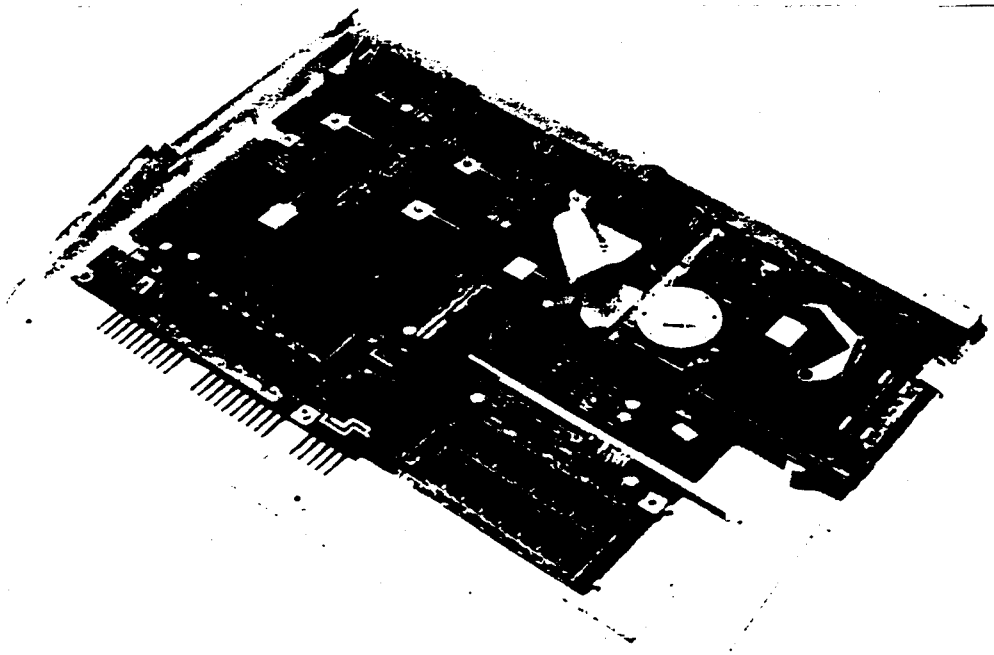




Real Time Power

COMMODORE AMIGA 500
DIE NEUE COMPUTERGENERATION





COMMODORE AMIGA 500

Amiga 500: Erster Heimcomputer mit 16(32) bit-Technologie und Multitasking

Ton- und Trickfilmstudio eingebaut / Amiga-DOS integriert Programme selbst

Der Amiga 500 hat schon in der Grundausstattung eine Speicherkapazität von insgesamt 0,75 MB (0,5 MB Arbeitsspeicher/256 KB Betriebssystem) und kann mit einer Steckkarte einfach um 512 KB erweitert werden. Ein 3,5 Zoll Mikrodiskettenlaufwerk mit formatierter Kapazität von 880 KB ist zusammen mit einer großzügigen Volltastatur in einem Gehäuse integriert. Anstelle des Amiga-Farbmonitors kann über einen zusätzlichen PAL-Coder auch ein Farbfernseher angeschlossen werden. Der Amiga 500 arbeitet mit einer 68000 CPU, die von drei weiteren eigenständigen Prozessoren für Grafik, internes Datenmanagement und für Kommunikation unterstützt wird. Mit dem Multitasking-Betriebssystem Amiga-DOS arbeitet er mehrere Programme gleichzeitig ab.

Unverständliche Bedienerkommandos gehören beim Amiga der Vergangenheit an. Alle Computerfunktionen werden mit der Maus gesteuert, indem die gewünschten Funktionen am Bildschirm "angeklickt" werden. Auf Tastendruck lassen sich die Fenster

öffnen, verschieben und schließen, so daß im Computer wie in einem farbigen Bilderbuch geblättert werden kann. Der Amiga unterstützt intuitives Arbeiten. Deshalb nennen die Entwickler diese Bedieneroberfläche "Intuition".

Die schnelle Grafik des Amiga liefert der Spezialprozessor "Denise", ein Bit-Blitter für den schnellen Datentransfer. Er setzt beispielsweise eine Million Bildpunkte pro Sekunde. Er kann außerdem seine Daten aus drei verschiedenen Quellen holen, so daß er auch trickfilmschnelle Sequenzen zeichnen kann. Der Videoprozessor "Agnus" bringt bei einer sehr hohen Auflösung von 640 x 512 Bildpunkten 16 Farben auf den Bildschirm, wobei aus insgesamt 4096 Farbtönen ausgewählt werden kann. Er kann aber auch 4096 Farbtöne gleichzeitig darstellen, wenn man eine geringere Auflösung wählt. Um die interne Steuerung des Datenflusses braucht sich die 68000 16(32) bit - CPU auch nicht zu kümmern. Das macht "Paula", ein Spezialprozessor für Schnittstellenverwaltung und Zugriffsorganisation.

Paula steuert auch Audio Ein- und Ausgabe und nimmt es dabei mit hochwertigen Stereoanlagen und Synthesizern auf: Vier Tonkanäle für zwei Stereo-Ausgänge können voll synthesizermäßig angesteuert werden. Die Digital/Analog - Wandler zur Wiedergabe über die Stereoanlage sind im Amiga bereits eingebaut. Ähnlich wie bei der Videoschnittstelle, über die von einem Videorekorder oder einer Filmkamera Bilder in den Amiga eingelesen werden können, ist auch ein Mikrofonanschluß (Audio-in) vorhanden. Über ein Spezialinterface können Naturstimmen und Musik durch ein Mikrofon vom Amiga aufgenommen und in originalgetreuer, aber auch in beliebig veränderter Form gespeichert und wiedergegeben werden.

Es gibt drei Gründe, die den Amiga zum idealen Lerncomputer machen. Einer ist, daß der Amiga durch Bilder und Filme lehren kann. Er kann auch sprechen. Er tut das in Wechselwirkung mit dem Lernenden. Es gibt derzeit kein anderes Gerät, das derartig viele Möglichkeiten im Unterricht bietet. Das gilt auch in hohem Maße für das Lernen zuhause. Ein anderer Grund

ist, daß die Computertechnik, mit deren Hilfe gelernt wird, so aktuell und modern ist, daß sie von Bürosystemen erst im Laufe der nächsten Generation erreicht (und dann auch entsprechend teuer) wird. Wer mit dem Amiga arbeitet, beherrscht das Computerprinzip von Multitasking und integrierter Kommunikation, das für Jahre hinaus der Standard in der Computertechnik sein wird. Zum dritten ist der Einstieg äußerst leicht. Wie die Maus den Handbewegungen, so folgen die Aktionen des Computers den Gedanken. Selbst kleine Kinder oder ihre Großeltern erlernen den Umgang mit dem Amiga im Handumdrehen.

Höchste Integration und modernste Fertigungstechnik kommen der Zuverlässigkeit und Lebensdauer, aber auch dem Preis zugute. Der Amiga 500 ist komplett mit Schnittstellen ausgestattet. Zwei neunpolige Normstecker nehmen die Anschlüsse für Maus und Joystick auf, zwei Audiobuchsen führen die beiden Stereokanäle nach außen, ebenso ist ein monochromer Video-Anschluß (Cynch-Buchse) vorhanden. Ein Anschluß für ein externes Laufwerk fehlt ebensowenig wie parallele Druckerschnittstelle und serielle Schnittstelle für die Datenkommunikation. Alle Schnittstellen beim Amiga 500 entsprechen den geltenden Normen, so daß keine Spezialkabel für die Peripherie angeschafft werden müssen.

Datenübersicht AMIGA 500

Prozessoren/Controller

CPU:	Motorola 68000, 16/32 bit
Taktfrequenz:	7,14 Mhz
Co-Prozessoren:	3 Co-Prozessoren für DMA, Video, Graphik und Sound
Grafik- und Zeichentrick-Chip "Agnus"	Bit-Blitter - Hochgeschwindigkeits-Datentransfer mit Verknüpfung von Daten aus drei verschiedenen Quellen für die Bewegung von Objekten - schnelles Linien-Zeichnen und Flächen-Füllen mit 1 Mio Punkte pro Sekunde, baut 60 Bilder pro Sekunde auf

Amiga 500 mit Maus und externem Farbmonitor

- erkennt Kollisionen zwischen zwei bewegten Objekten

Copper/Coprozessor
- ist mit Bildschirm synchronisiert, wird von Rasterstrahl gesteuert

- versorgt die Register von Agnus, Paula und Denise

- kontrolliert 25 DMA-Kanäle

Video Chip "Denise":

Graphik-Modus:
- 320 x 256
- 320 x 512
- 640 x 256
- 640 x 512

Farben
- 32 bei 320 Spalten
- 16 bei 640 Spalten aus 4096 Farbtönen
- bis zu 4096 Farbtöne je nach Betriebsart gleichzeitig darstellbar

Text-Modus:
- wahlweise 60 oder 80 Zeichen breit, zu 25 Zeilen in Farbe

Sprite-Controller/8
- faßt auf Wunsch zwei Sprites zusammen
- Kollisionsdetektor mit Prioritätenfestlegung bei Überschneidung

Video-Display:

625 Zeilen vertikal, Frequenz 50 Hz
Videospeicher max. 512 kB

Port-Chip "Paula":

DMA-Steuerung
- steuert den RAM-Zugriff aller berechtigten Bausteine

I/O-Steuerung
- serielle Schnittstelle
- parallele Schnittstelle
- Control-Ports
- Tastatur
- Audio-Ausgabe
  - 4 Tonkanäle für zwei Stereoausgänge
  - programmierbare Amplitude und Sampling-Rate
  - 9 Oktaven
  - komplexe Wellenform
  - Amplituden- und Frequenzmodulation
- Audio-Eingabe
  - Steuerung eingelesener Naturstimmen oder von Musik-Originalen (über Spezialinterface)

Speicher

Speicherkapazität: (insgesamt)
- 0,75 MB
- 0,5 MB RAM
- 256 KB ROM für Kickstart 1.2
- Arbeitsspeicher intern um 512 KB erweiterbar

Massenspeicher:

integriert
- 1 x 3 1/2 Zoll Mikro Floppy-Disk
  - 880 KB formatiert

extern
- 3 1/2 Zoll Mikro Floppy Disk

Eingabeelemente

Tastatur
- prozessorgesteuert
- 96 Tasten
- separater Rechenblock
- separate Cursor-Tasten
- 10 Funktionstasten
- Tastatur integriert
- Help-Tasten

Maus
- zwei Bedienungsknöpfe
- optomechanisch

Audio-Eingabe
- über HiFi-Geräte, Videorecorder, CD-Player
- Mikrofon/Verstärker
- Musikinstrumente mit Midi-Interface

Video-Eingabe
- mit Genlock-Interface / Synchronisation von Computer mit Videoquellen und Darstellung als hintere Bildebene auf Monitor
  - über Videokamera
  - Bildplatte
  - Fernseher
  - Bildschirmtext
  - Scanner
- Bildbe- und verarbeitung über Video-digitizer

Schnittstellen

Seriell:

Programmierbarer Port
- Baudraten bis 31.250
- RS 232 C
- Midi über Adapterstecker

Parallel:

Programmierbarer Port
- für Ein- und Ausgabe
- normalerweise als Centronics konfiguriert

Parallel:	Programmierbarer Port - für Ein- und Ausgabe - normalerweise als Centronics konfiguriert
Controller Ports:	2 Ports - Maus - Grafiktablett - Lightpen - Steuerknüppel - Drehregler
Video/Audio:	2 Ports - Cynch Stereo/Audio - RGB analog, digital
Tastatur:	1 Port
System-Steckplätze:	1 Steckplatz für RAM-Erweiterung
Composite-Video:	über externen PAL-Coder

Ausgabemedien

Monitor/TV:	Color-Monitor über RGB-Anschluß, TV-Anschluß über externen PAL-Coder
Sprach/Sound-ausgabe:	Eingebauter Lautsprecher oder über externe Tonquellen, 4 unabhängige Soundkanäle als 2 Stereokanäle konfiguriert
Datenfernüber-tragung:	Übertragung von digitalisierten Informationen aus Texten, Grafiken, Bildern, Sprache und Musik je nach Datenleitung
Netzteil:	220 Volt, 50 Hz

A M I G A
S Y S T E M - S O F T W A R E

Irgendwo zwischen "mir" und den Chips!

- System-Software: Verbindung zwischen Mensch und Maschine

- Starten des Systems: Kickstart oder Workbench - oder beide

- Die System-Software macht das Multitasking

- Amiga -DOS ist offen für alle Erweiterungen

Irgendwo zwischen "mir" und den Chips!

Bei dem Versuch, die Position von System-Software in einem Gesamtsystem zu beschreiben, tappt man gedanklich irgendwo in den - je nach Standort - geheimnisvollen oder interessanten Tiefen eines Computers. Jedermann ahnt, daß diese Art von Software benötigt wird, um die einzelnen Bits der Hardwareregister zu steuern. Auch kann das, was sich als Bildschirmmeldung zeigt, nicht zufällig in das System implementiert worden sein.

An dieser Stelle ist man gar nicht mehr so weit von der eigentlichen Intention und Aufgabe von System-Software entfernt. Sie ist das Medium, mit dem ein großer Teil der Idee und Philosophie des Gesamtsystems Amiga zum Anwender transportiert wird, auch wenn sie hauptsächlich die Bits und Bytes im System hin- und herschaufelt. So ist es die System-Software, die die Ideen in Aktionen umsetzt, ohne den Benutzer selbst damit zu belasten, wie er seine Ideen dem Computer am besten mitteilt. Er soll intuitiv mit dem System umgehen und es für sich einsetzen lernen.

System-Software: Verbindung zwischen Mensch und Maschine

Als Verbindung zum Benutzer stehen vom Amiga Tastatur und Maus als Eingabe- und primär der Monitor als Ausgabe-Medium zur Verfügung. An dieser Stelle tritt die System-Software als Vermittler auf den Plan und offeriert damit dem Anwender eine der Stärken des schon vorgestellten Amiga-Konzepts: Die Bildschirmausgabe ist so gestaltet, daß der Benutzer seine eingegebenen Aktionen direkt verfolgen und kontrollieren kann. WYSIWYG! (What-you-see-is-what-you-get!). Zu den weiteren Merkmalen von bedienerfreundlichen Computersystemen gehören zweifelsohne:

- Leichtes Kennenlernen des Systems durch Probieren (Anklicken von Icon's)
- Einfaches (Wieder-)Erkennen von Zusammenhängen im System (Fenstertechnik)
- Bekannte Strukturen (DOS-Befehle)
- Unterstützung intuitiven Handelns.

Der Benutzer soll eine ganz leichte Kontrolle über das System haben. Er bekommt deshalb immer eine Situationsmeldung vom System:

- Aktionen fordern Bestätigung = OK
- Ausweg vorhanden = CANCEL
- Aktionen geben Feedback = WAIT

Starten des Systems: Kickstart oder Workbench - oder beide

Um diese Features in das System Amiga zu integrieren, wurde unter der freundlichen Oberfläche eine leistungsfähige System-Software implementiert, die die komplexe Hardware des Amiga steuert und kontrolliert. Ein wesentlicher Teil dieser Software wird bereits mit dem Einschalten des Amiga aktiviert: Der im ROM implementierte KICKSTART in der neuesten Version 1.2.

Was ist nun eigentlich dieser "Kickstart"?

Er enthält die wesentlichen Teile der Software, die z.B. im altbekannten PC im BIOS (als ROM) und im speicherresidenten Teil des DOS (wird beim Booten von der Floppy oder der Harddisk geladen) zu finden sind. Um die in dieser Maschine steckenden Ideen zu begreifen, müssen wir ein wenig tiefer in das komplexe Software-System zwischen Benutzer und der eigentlichen Hardware eindringen.

Im Folgenden sind die wesentlichen Software-Elemente des Kickstarts mit ihren wichtigsten Aufgaben angeführt:

- EXEC:

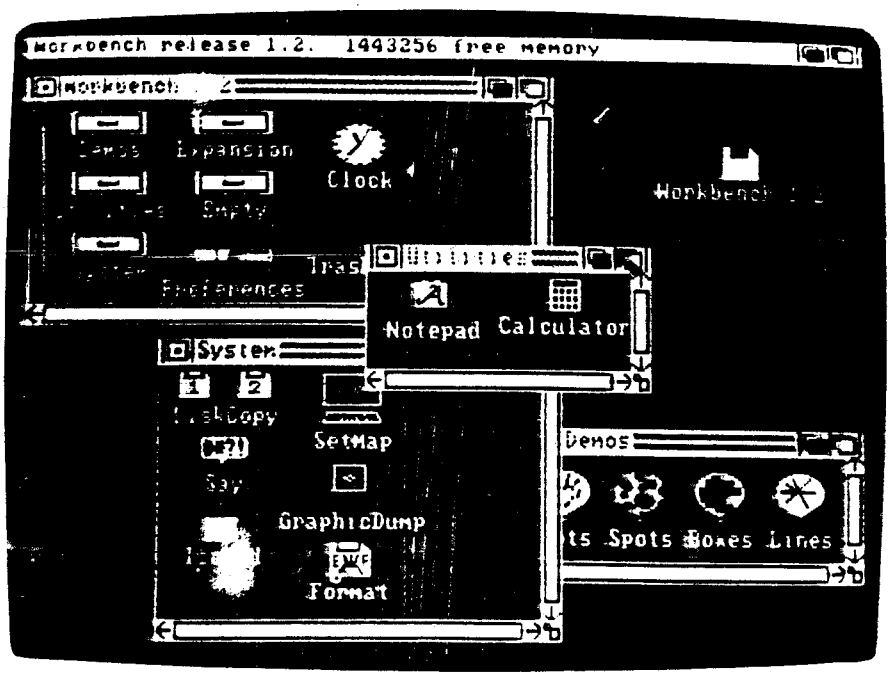
  Hardwarenächster allgemeiner Teil der System-Software

  - kontrolliert den 68000 Prozessor des Amiga
  - teilt den verschiedenen TASKS ihrer Priorität entsprechende Zeitscheiben der Prozessorzeit zu und ordnet diese Tasks in Warteschlangen (Multitasking)
  - verwaltet die System INTERRUPTs
  - kommuniziert über MESSAGES mit anderen Prozessen.

- Amiga-DOS:

  Verwaltet das File System des Amiga

  - Steuerung von Stapel-Jobs, Batch Verarbeitung
  - startet, unterbricht und informiert über Prozesse im System
  - Command-Line-Interpreter (CLI) schafft eine PC-ähnliche Umgebung - prompt, zeilenorientiert
  - Beinhaltet Kommandos und Utilities zur Steuerung des Systems.



Amiga Workbench 1.2 als mausgesteuerte Benutzeroberfläche.

- DEVICEs:

  Spezielle Treiber für die verschiedenen Baugruppen der Hardware. Schnittstellen zwischen der multitaskingfähigen Software und der singletaskingfähigen Hardware

  Beispiel: Zwei Prozesse wollen auf die Floppy zugreifen, die jedoch nur einen Datenstrom zur gleichen Zeit bearbeiten kann. Im Task-Disk Device Treiber werden beide Anforderungen verwaltet und nacheinander bearbeitet.

  - Track Disk-Device steuert einen oder mehrere Floppy-Laufwerke
  - Keyboard Device nimmt Eingaben von der Tastatur entgegen
  - Input Device sammelt und verteilt die Eingaben von Tastatur, Maus und anderen Prozessen
  - Console Device konvertiert den Roh-Input des Input Device in ASCII oder entsprechende Formate und bereitet Escape-Sequenzen auf
  - Gameport Device koordiniert Maus- und Joystickaktionen
  - Audio Device kontrolliert den Audioausgang des Amiga
  - Serial und Printer Device kommunizieren mit den entsprechenden Ports des Amiga.

Die Steuerung der Bildschirmausgabe nimmt eine Sonderstellung ein, da sie aus einer Sammlung von Text- und Graphikausgaberoutinen besteht, die von INTUITION zur Ausgabe auf den Monitor benutzt werden.

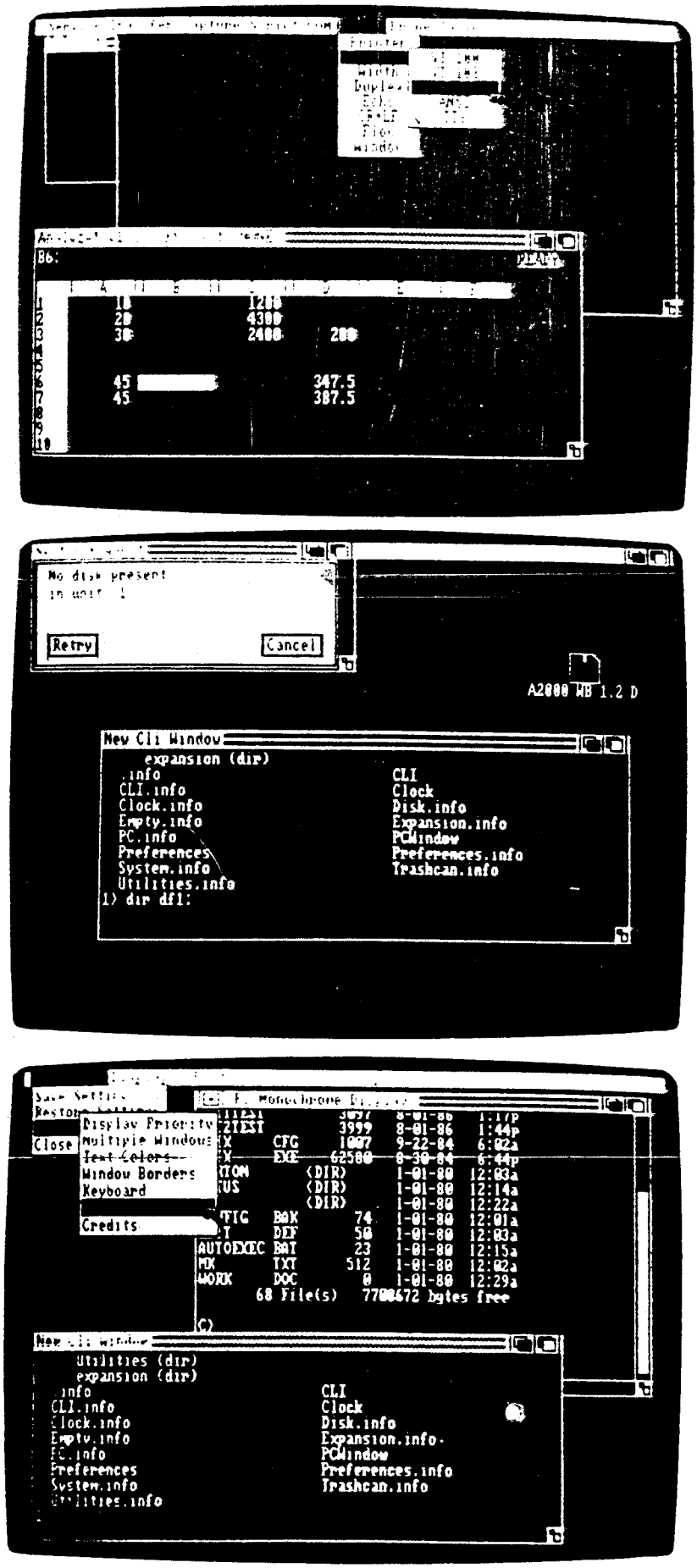
- **INTUITION:**
  Verantwortlich für alle graphischen Aktionen auf dem Amiga-Monitor. Benutzt Routinen der Graphic- und der Layer-Bibliothek für Ausgaben auf den Bildschirm.
  - Öffnen, Schliessen, Verschieben und Aktivieren von WINDOWs und SCREENs als deren Hintergrund
  - Steuerung der Pull Down-Menüs
  - Kontrolle der GADGETs
  - Steuerung der REQUESTER
  - Anzeigen von System- oder Programmfehlern durch ALERTs
  - Koordiniation von Signalen im System (EVENTS)

  Beispiele für INTUITION zeigen die Abbildungen 22,23 und 24 auf der Seite 49.

Die System-Software macht das Multitasking

Wie gerade erwähnt, laufen alle Aktivitäten der besprochenen Module gleichzeitig im System. Schon bevor ein Benutzer auch nur eine Aktion gestartet hat, arbeiten Tasks im Amiga parallel, miteinander kommunizierend und sich gegenseitig unterstützend; das ist echtes Multitasking!

Die Multitaskingfähigkeit des Amiga ist vom Anwender leichter zu steuern, wenn vorher die Workbench von der Diskette geladen wurde. Jetzt stehen ICONs, DRAWERs und alle besprochenen Features von INTUITION zur Verfügung. Durch "Anklicken" mehrerer Programm-Icons nacheinander werden im Multitasking alle Programme gleichzeitig aktiviert.



Beispiele für Arbeitsweise INTUITION

Amiga-DOS ist offen für alle Erweiterungen

Auf die Workbench- und Applikationsprogramme wird an anderer Stelle eingegangen. Im Folgenden ist die Erweiterung und Ausbaufähigkeit der System-Software anhand einiger Beispiele erläutert.

- **KEYMAPS:**
  Mit der Workbench Diskette stehen dem Anwender zwölf unterschiedliche Tastatur-Tabellen für alle europäischen und nordamerikanischen Länder zur Verfügung. Die System-Software liefert alle Routinen und Utilities (SETMAP), um diese oder weitere Tabellen (Keymaps) für andere Länder oder spezielle Keyboards in den bereits besprochenen Console-Device Treiber einzubinden.

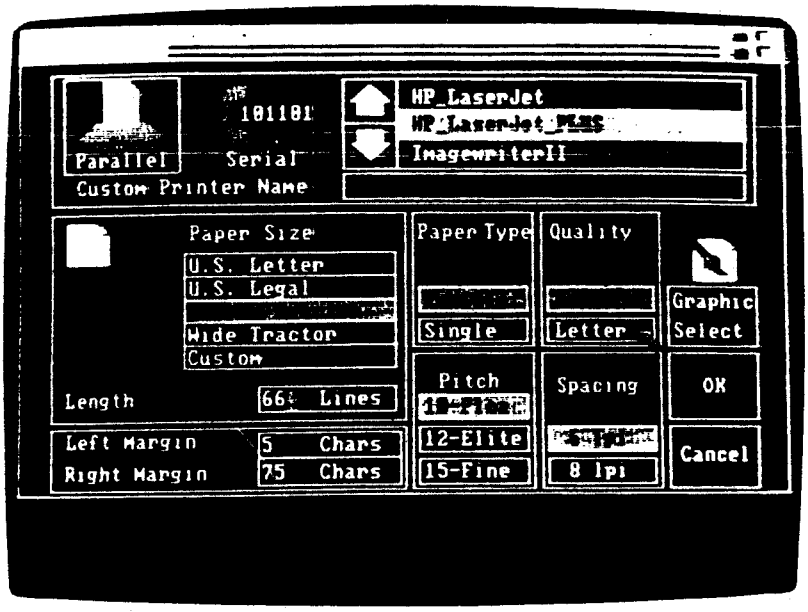
- **FONTS:**
  Der Amiga stellt seinem Benutzer schon mit der WORKBENCH acht verschiedene Zeichensätze in unterschiedlichen Zeichengrößen zur Verfügung, die mit geeigneten Utilities (Font-Editor) verändert oder neu kreiert werden können. Hier zeigt sich der Amiga für jede Art von Textprozessing flexibel und anpassungsfähig.

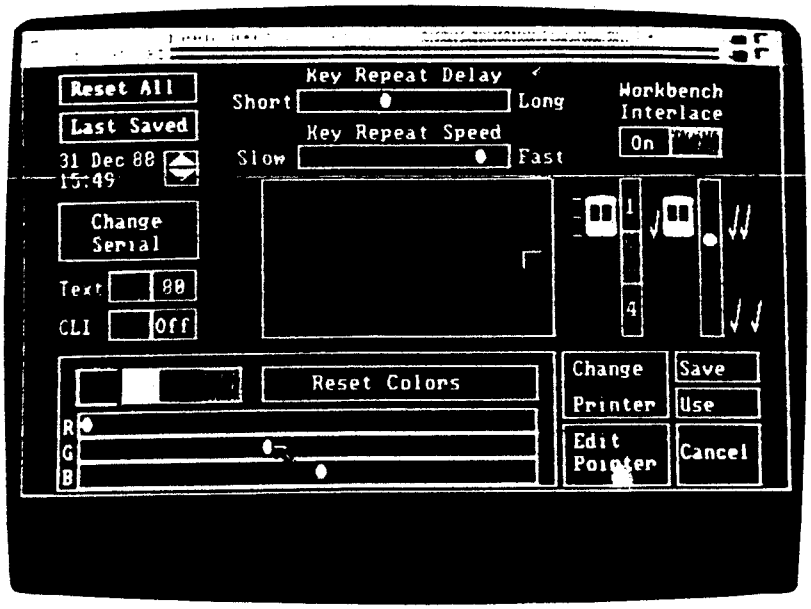
- **DEVICE Treiber:**
  Ein spezielles Sub-Directory der WORKBENCH enthält alle verfügbaren Device Treiber, um die verschiedenen internen und externen Baugruppen des Amiga in das Software System einzubinden. Die MOUNTLIST beschreibt die logischen Eigenschaften und Formate der aktivierbaren Device Treiber.

- Printer Treiber:
  In den Printer Treibern, einer Untergruppe der beschriebenen Device Treiber, sind die speziellen Eigenschaften der üblichsten Drucker beschrieben. Die WORKBENCH wird mit 16 Druckertreibern ausgeliefert, deren Anzahl laufend zunimmt.

- EXPANSION Library:
  Mit der EXPANSION Library bietet der Amiga die Möglichkeit, die System-Software um weitere System Routinen zu erweitern. Besonders der neue Amiga 2000 nutzt dieses Feature, um die

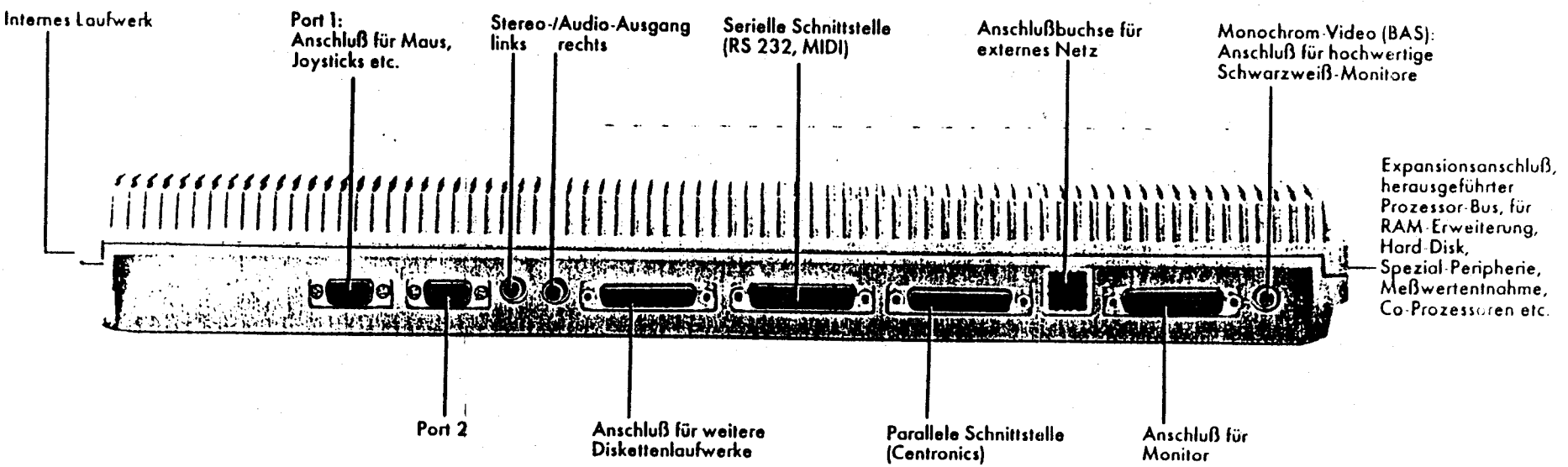
Erweiterungsboards in den Slots in die Software-Umgebung einzubinden. Jedes neue Board, welches dem System neue Eigenschaften offeriert (PC/XT-Emulator, Harddisk-Controller), kommuniziert mit Hilfe einer Sammlung von System-Routinen mit der System-Software. Diese neuen Routinen werden von der automatischen System-Konfiguration (AUTOCONFIG) in der Expansion Library gefunden und der entsprechenden Hardware in einem der Amiga Erweiterungsslots zugeordnet. Damit wird diese für den Amiga ansprechbar und steht dem System und so dem Anwender zur Verfügung.





Das Amiga-Betriebssystem stellt eine Reihe von wertvollen Tools zur Verfügung, hier Beispiele für Druckeranpassung und Farbmischung.

Amiga Hardware


Internes Laufwerk
Port 1:
Anschluß für Maus,
Joysticks etc.
Stereo-/Audio-Ausgang
links
rechts
Serielle Schnittstelle
(RS 232, MIDI)
Anschlußbuchse für
externes Netz
Monochrom-Video (BAS):
Anschluß für hochwertige
Schwarzweiß-Monitore
Expansionsanschluß,
herausgeführter
Prozessor-Bus, für
RAM-Erweiterung,
Hard-Disk,
Spezial-Peripherie,
Meßwertentnahme,
Co-Prozessoren etc.
Port 2
Anschluß für weitere
Diskettenlaufwerke
Parallele Schnittstelle
(Centronics)
Anschluß für
Monitor

Denise: dieser Spezialchip kontrolliert Grafik, Sprites und Farben

Die »Fat Agnes«: Blitter, Copper und die DMA-Logik sind in diesem Baustein zusammengefaßt

Ein-/Ausgabe-Baustein (8520)

Paula ist zuständig für Diskettenoperationen, Tonausgabe, Interrupts und den seriellen Port

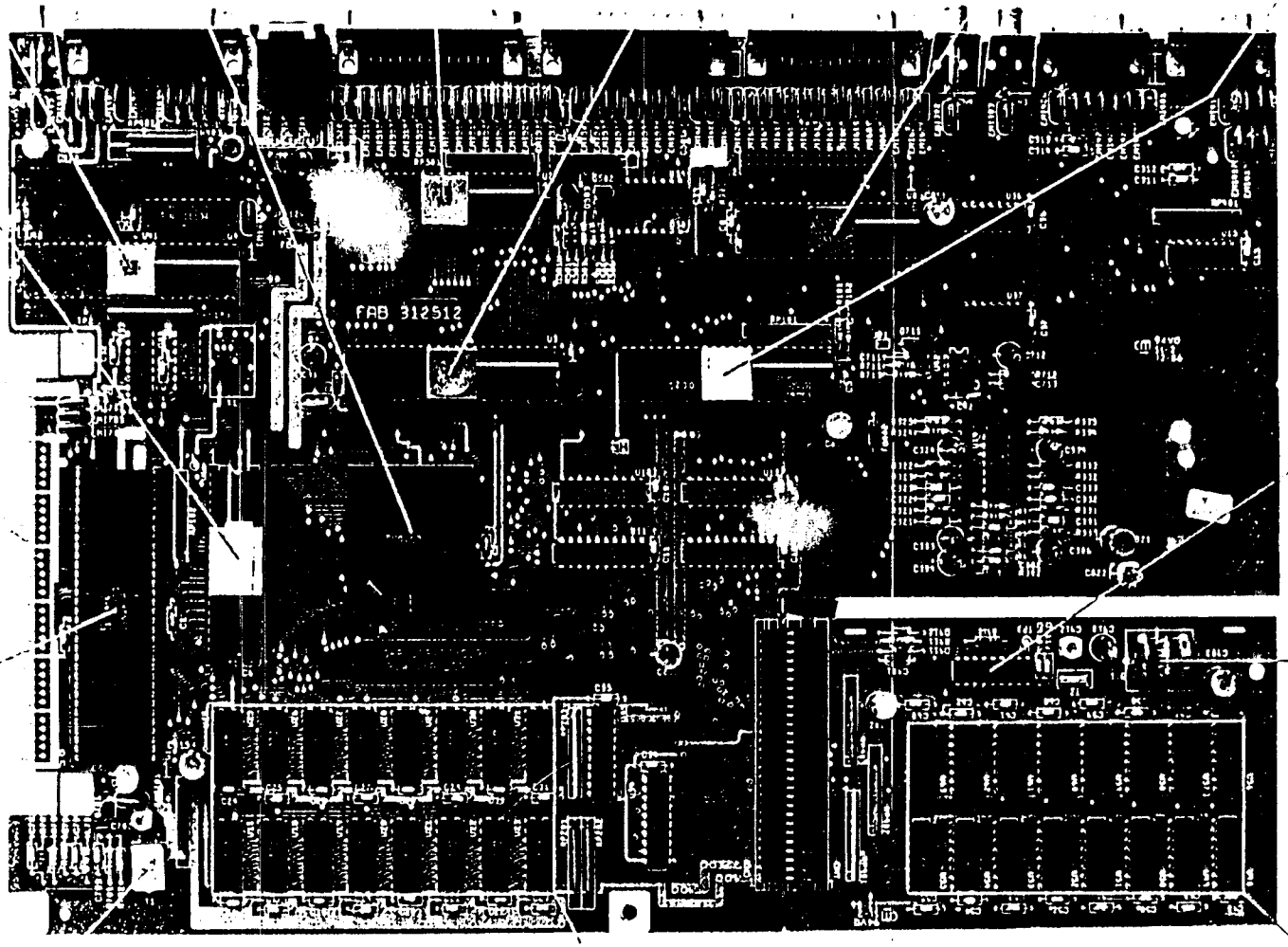
Ein-/Ausgabe-Baustein (8520)

Eine Vielzahl von Logikfunktionen vereinigt dieser Gate-Array-Chip in sich (Spitzname: Gary)

Kickstart 1.2 im ROM. Das gesamte, 256 KByte große Betriebssystem findet darin Platz.

Alle wichtigen Signalleitungen liegen am Expansionsport

Das Herzstück des Amiga 500: der 68000-Prozessor



Der Uhr-/Kalender-Chip macht das Einstellen von Datum und Zeit per Hand überflüssig

Ein Akku sorgt dafür, daß die Uhr auch bei ausgeschaltetem Computer weiterläuft

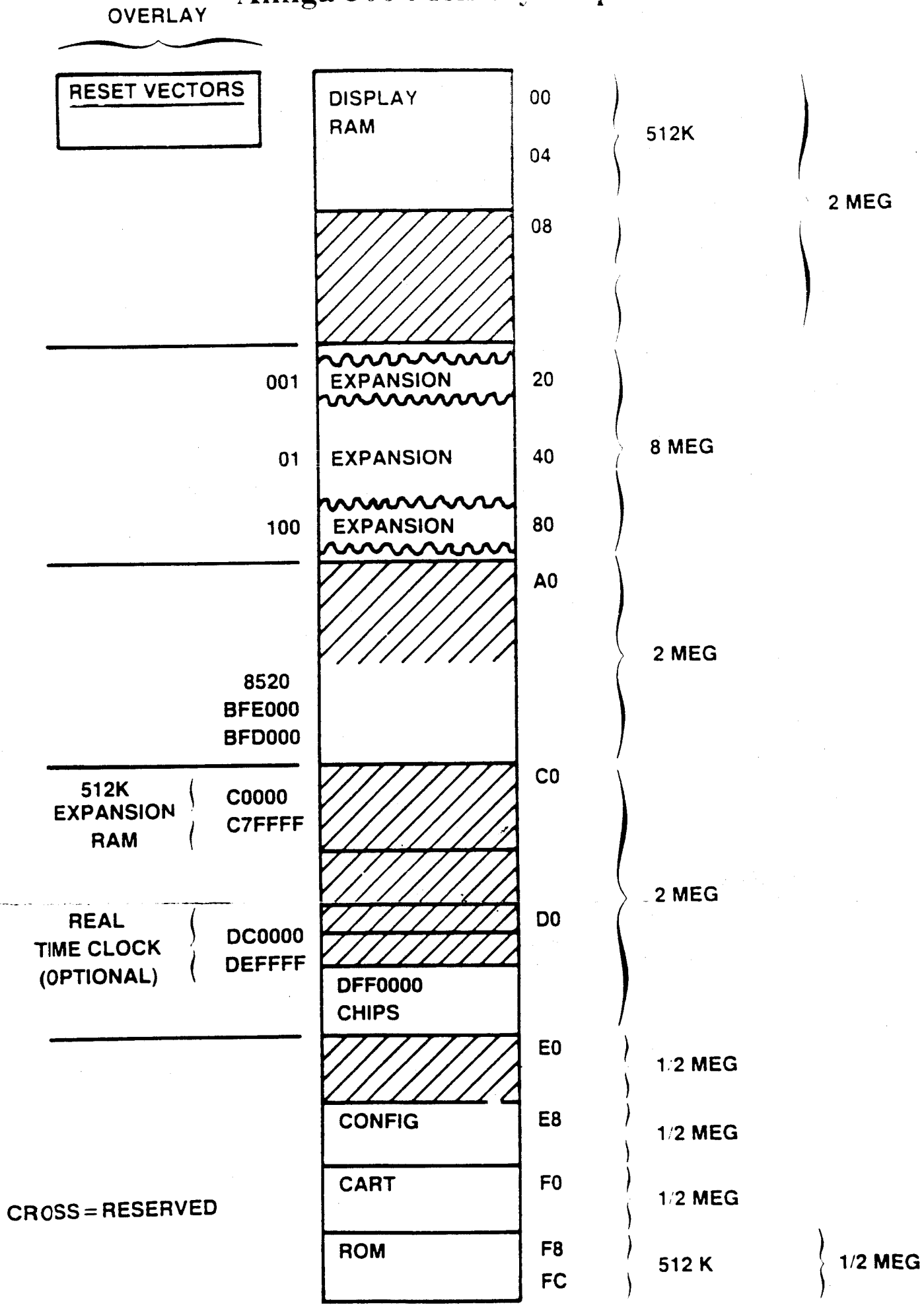
Quarz für Videotakt (28,63 MHz). Durch Teilen dieser Frequenz ergibt sich der Prozessortakt von 7,16 MHz

16 einzelne 256-KBit-RAMs mit einer Zugriffszeit von 150 Nanosekunden ergeben den 512-KByte-RAM-Speicher der Amiga-500-Grundversion

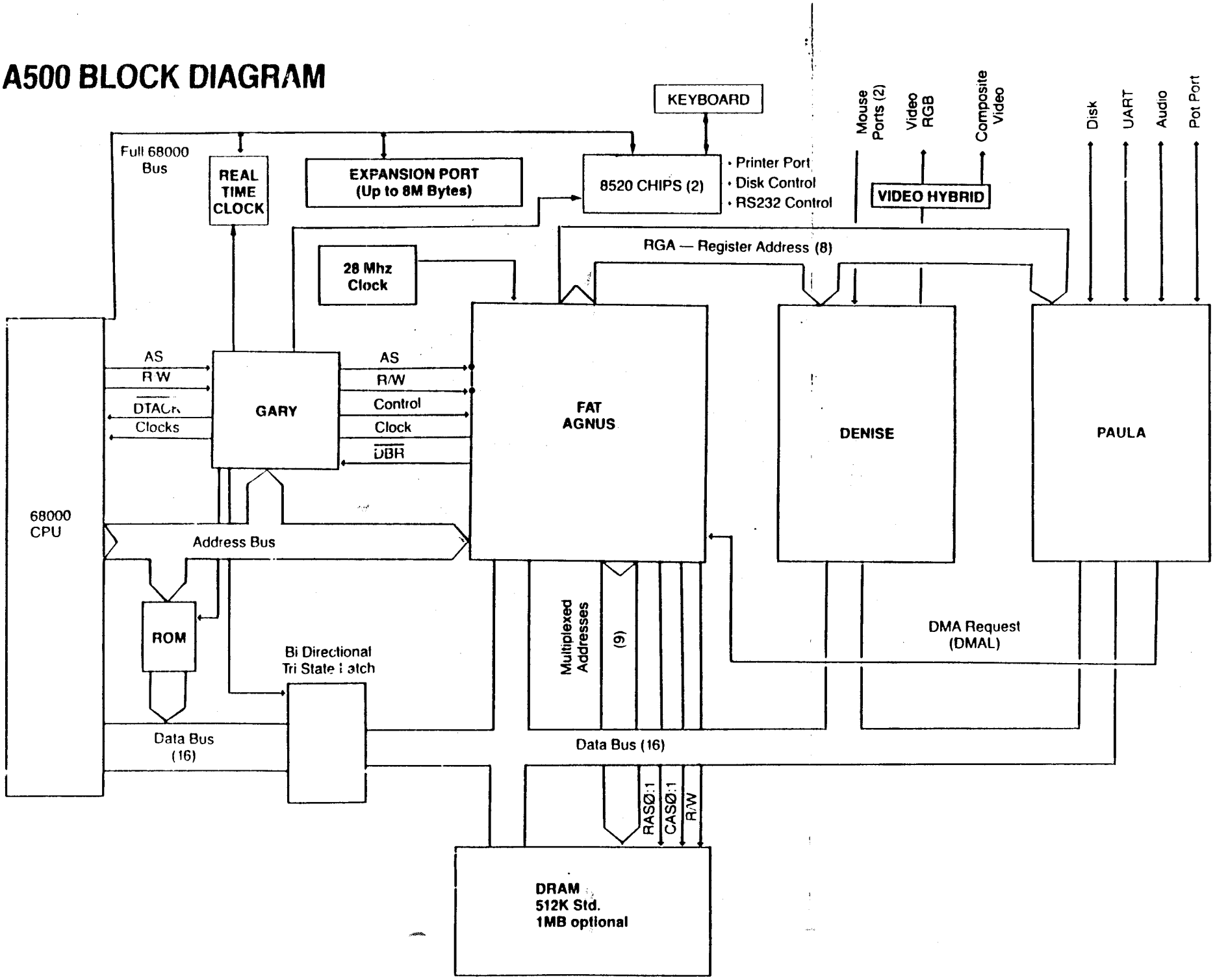
Weitere 512 KByte stellt die einsteckbare Erweiterungskarte zur Verfügung

Übersichtlich und sauber aufgebaut — die Hardware des Amiga 500 inklusive der zusätzlichen 512-KByte-RAM-Karte.

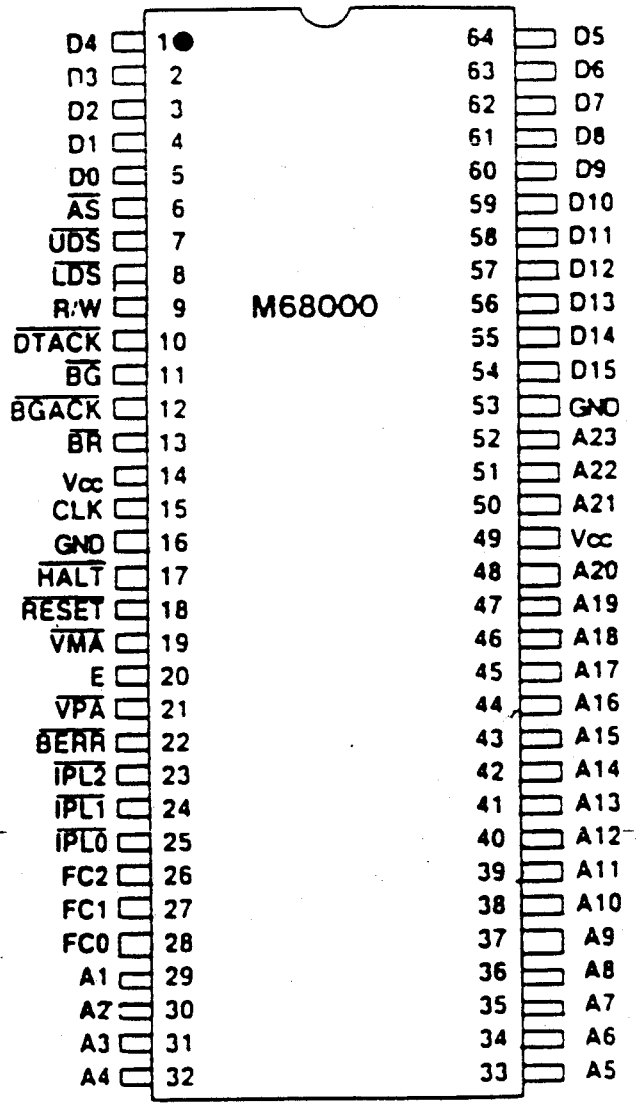
Amiga 500 Memory Map



A500 BLOCK DIAGRAM



— MC 68000 —
U1


M68000
D4 1
D3 2
D2 3
D1 4
D0 5
AS 6
UDS 7
LDS 8
R/W 9
DTACK 10
BG 11
BGACK 12
BR 13
Vcc 14
CLK 15
GND 16
HALT 17
RESET 18
VMA 19
E 20
VPA 21
BERR 22
IPL2 23
IPL1 24
IPL0 25
FC2 26
FC1 27
FC0 28
A1 29
A2 30
A3 31
A4 32
64 D5
63 D6
62 D7
61 D8
60 D9
59 D10
58 D11
57 D12
56 D13
55 D14
54 D15
53 GND
52 A23
51 A22
50 A21
49 Vcc
48 A20
47 A19
46 A18
45 A17
44 A16
43 A15
42 A14
41 A13
40 A12
39 A11
38 A10
37 A9
36 A8
35 A7
34 A6
33 A5

Signalbeschreibung MC 68000

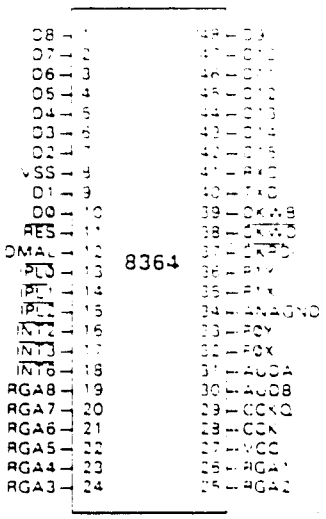
Signalname	Signal-name	Tristate	Funktion
A1-A23	A	ja	Adressleitungen
D0-D15	E/A	ja	Datenleitungen
AS	A	ja	Adress-Strobe
R/W	A	ja	Lesen/Schreiben
UDS, LDS	A	ja	Obere u. untere Daten-Strobes
DTACK	E	nein	Datentransfer-Quittung
BR	E	nein	Busanforderung
BG	A	nein	Buszuteilung
BGACK	E	nein	Buszuteilungs-Quittung
IPL0, IPL1, IPL2	E	nein	Interrupt/Priorität
BERR	E	nein	Busfehler
RESET	E/A	nein*	Rücksetzen
Halt	E/A	nein*	Halt
E	A	nein	Synchrontakt
VMA	A	ja	Gültige Speicheradresse
VPA	E	nein	Gültige Peripherieadresse
FC0, FC1, FC2	A	ja	Function Code
CLK	E	nein	Takt
Vcc	-	-	Speisespannung +5V
GND	-	-	Masse

* open drain

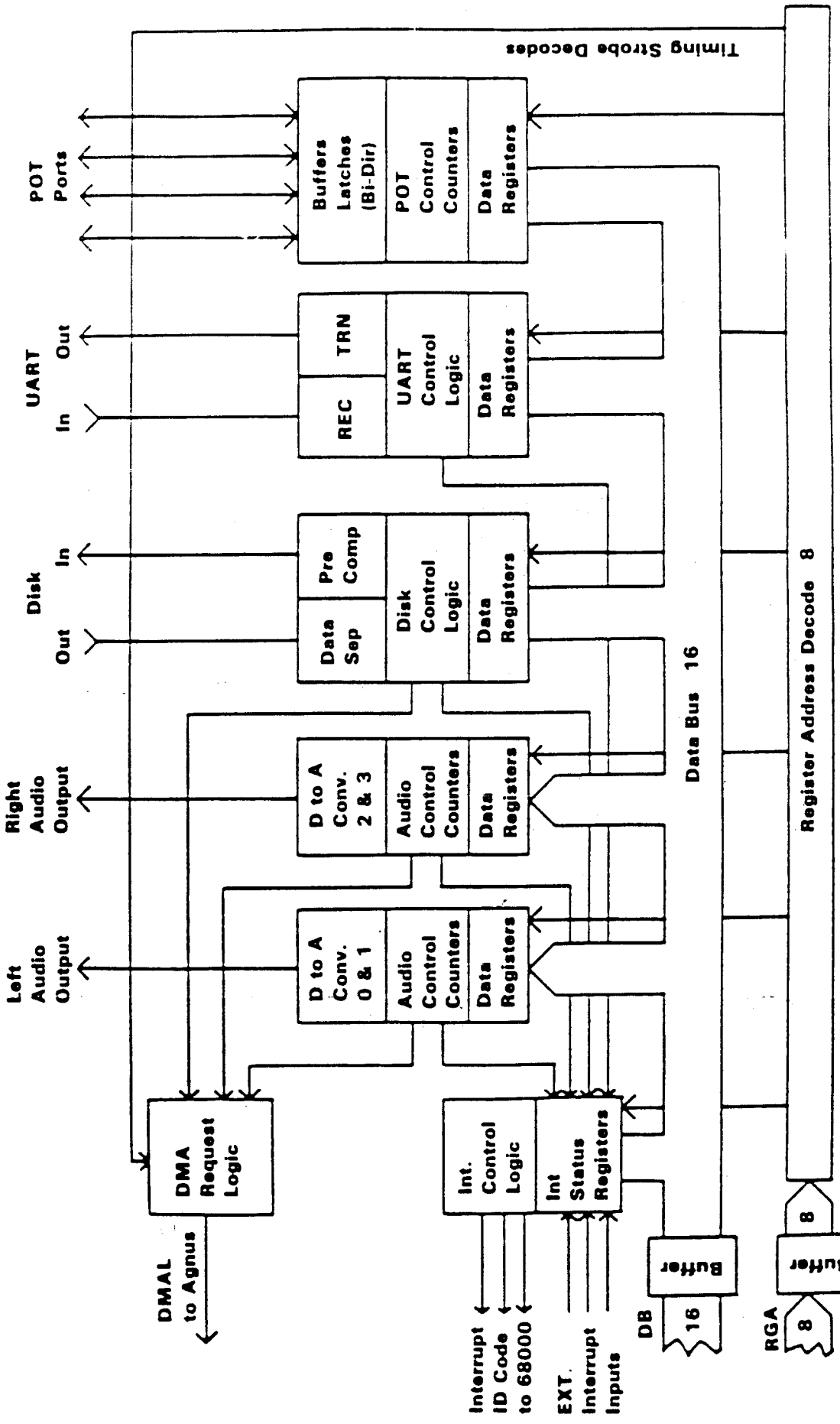
Custom Sound/Peripherals Chip
Paula

Features:

- Four voices of sound output configured as two stereo channels
- Nine octaves
- Complex waveforms
- Uses both amplitude and frequency modulation
- I/O controls for disk data and controller ports
- Microdisk controller
- Interrupt control system



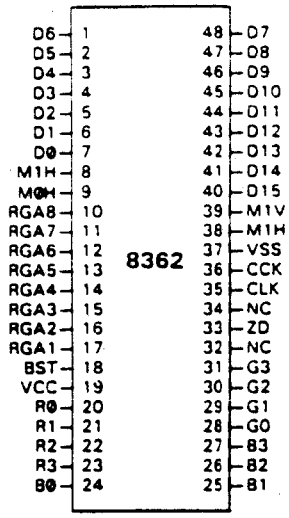
Pin	Name	Description	Type
1-7	D2-D8	Data Bus Lines 2-8	I/O
8	Vss	Ground	I
9,10	D0,D1	Data Bus Lines 0,1	I/O
11	/RES	System Reset	I
12	DMAL	DMA Request Line	O
13-15	/IPL0-2	Interrupt Line 0-2	O
16-18	/INT2,3,6	Interrupt Level 2,3,6	I
19-26	RGA1-8	Register Address 1-8	I
27	Vcc	+5 VDC	I
28	CCK	Color Clock	I
29	CCKQ	Color Clock Delay	I
30	AUDB	Right Audio	O
31	AUDA	Left Audio	O
32	POT0X	Pot 0X	I/O
33	POT0Y	Pot 0Y	I/O
34	VSSANA	Analog Ground	I
35	POT1X	Pot 1X	I/O
36	POT1Y	Pot 1Y	I/O
37	/DKRD	Disk Read Data	I
38	/DKWD	Disk Write Data	O
39	DKWE	Disk Write Enable	O
40	TXD	Serial Transmit Data	O
41	RXD	Serial Receive Data	I
42-48	D9-15	Data Bus Lines 9-15	I/O



Paula Block Diagram

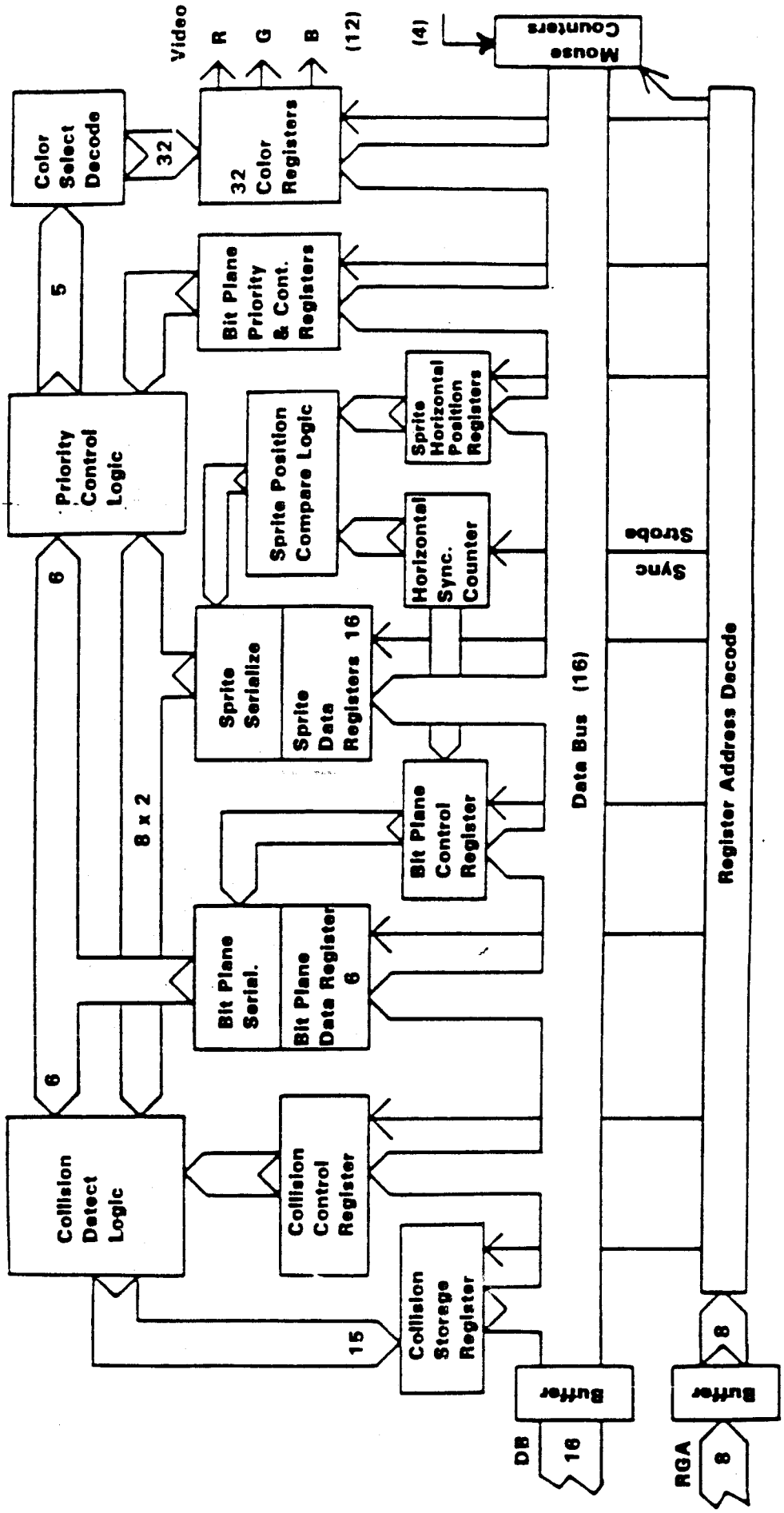
Custom Graphics Chip
Denise

Features:



- Many different resolutions
  320 × 200 up to 640 × 400
- 4096 colors on a TV or RGB monitor
- Eight re-usable sprite controllers
- 60 or 80 column text
- Same software for all TVs and monitors

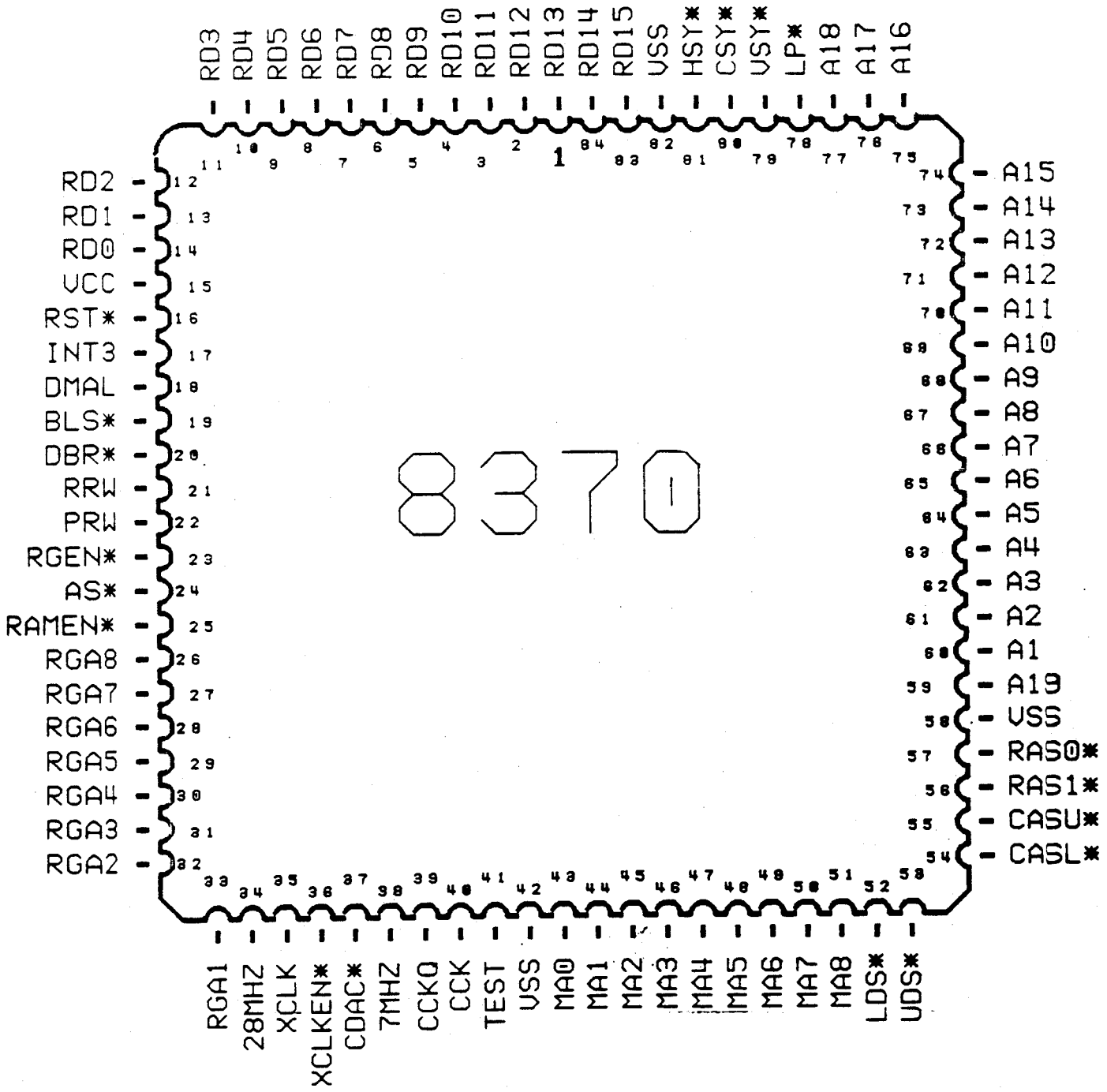
Pin	Name	Description	Type
1-7	D0-D6	Data Bus Lines 0-6	I/O
8	M1H	Mouse 1 Horizontal	I
9	M0H	Mouse 0 Horizontal	I
10-17	RGA1-8	Register Address 1-8	I
18	/BURST	Color Burst	O
19	Vcc	+5 VDC	I
20-23	R0-3	Video Red Bit 0-3	O
24-27	B0-3	Video Blue Bit 0-3	O
28-31	G0-3	Video Green Bit 0-3	O
32	N/C	No Connection	N/C
33	/ZD	Background Indicator	O
34	N/C	No Connection	N/C
35	7M	7.15909 MHz Clock	I
36	CCK	Color Clock	I
37	Vss	Ground	I
38	M0V	Mouse 0 Vertical	I
39	M1V	Mouse 1 Vertical	I
40-48	D7-D15	Data Bus Lines 7-15	I/O



Denise Block Diagram

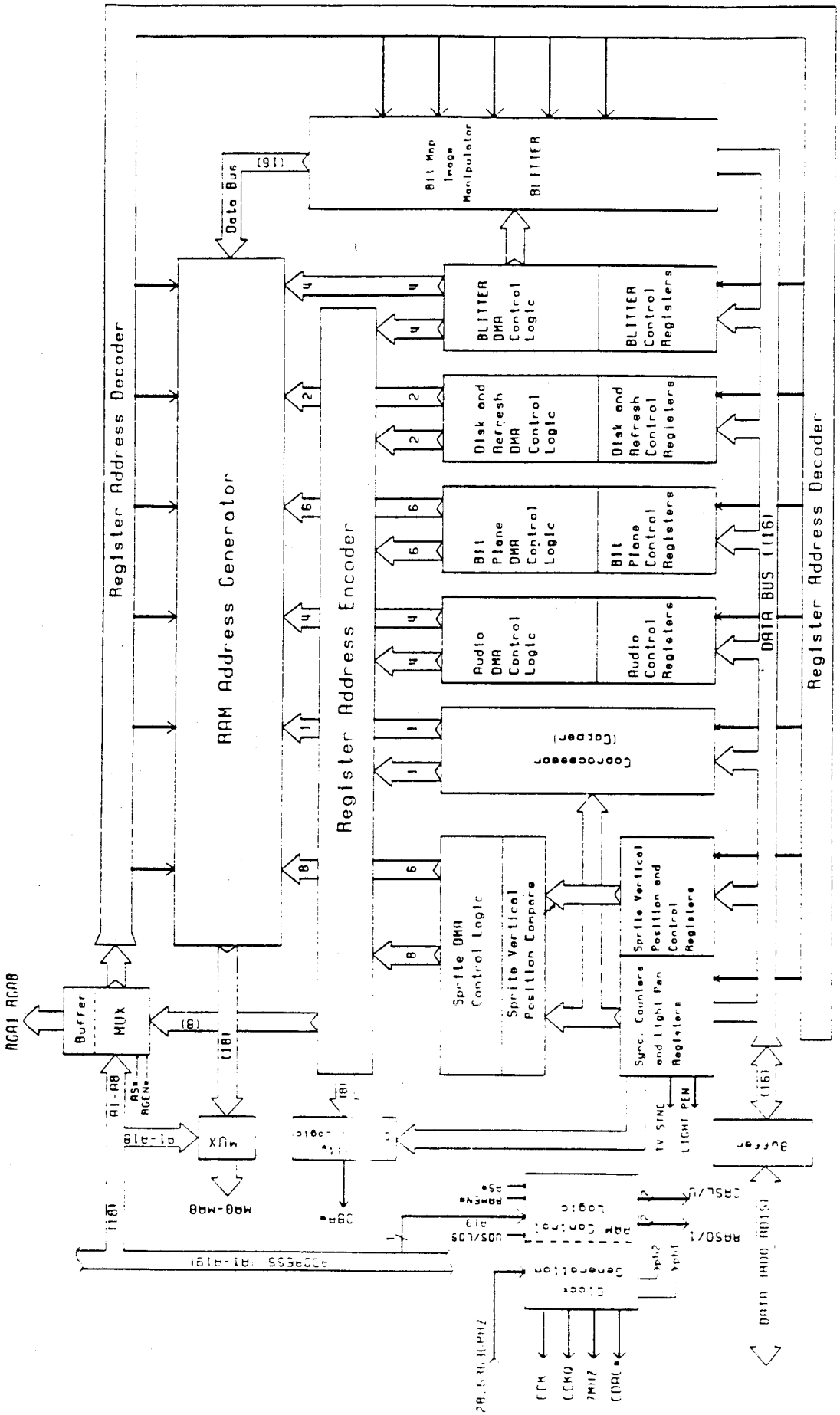
Custom Animation Chip

Fat Agnus


8370
RD3 RD4 RD5 RD6 RD7 RD8 RD9 RD10 RD11 RD12 RD13 RD14 RD15 VSS HSY* CSY* VSY* LP* A18 A17 A16
RD2 RD1 RD0 VCC RST* INT3 DMAL BLS* DBR* RRW PRW RGEN* AS* RAMEN* RGA8 RGA7 RGA6 RGA5 RGA4 RGA3 RGA2
A15 A14 A13 A12 A11 A10 A9 A8 A7 A6 A5 A4 A3 A2 A1 A19 VSS RAS0* RAS1* CASU* CASL*
RGA1 28MHZ XCLK XCLKEN* CDAC* 7MHZ CCKQ CCK TEST VSS MA0 MA1 MA2 MA3 MA4 MA5 MA6 MA7 MA8 LDS* UDS*

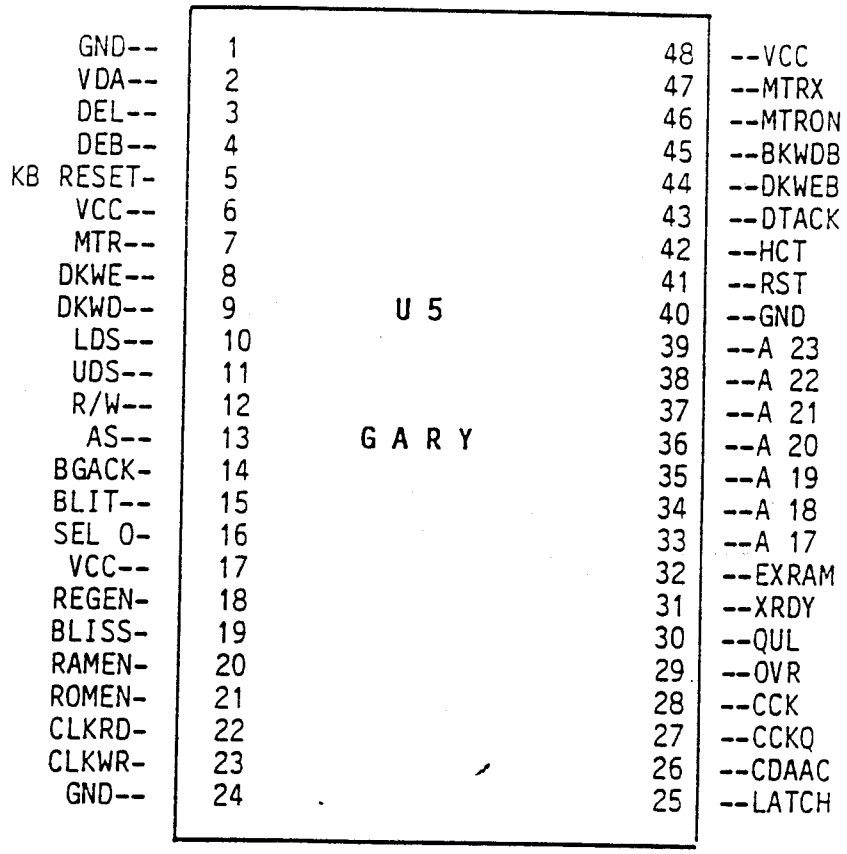
Features:

- Bit Blitter—Uses hardware to move display data—Allows high speed animation—Frees the CPU for other concurrent tasks
- Display Synchronized Coprocessor
- Controls 25 DMA Channels—Allows the disk and sound to operate with minimal CPU intervention
- Generates all system clocks from the 28 Mhz oscillator
- Generates all control signals for the video RAM and expansion RAM card
- Provides the address to the video and expansion RAM multiplexing



Fat Agnus Block Diagram

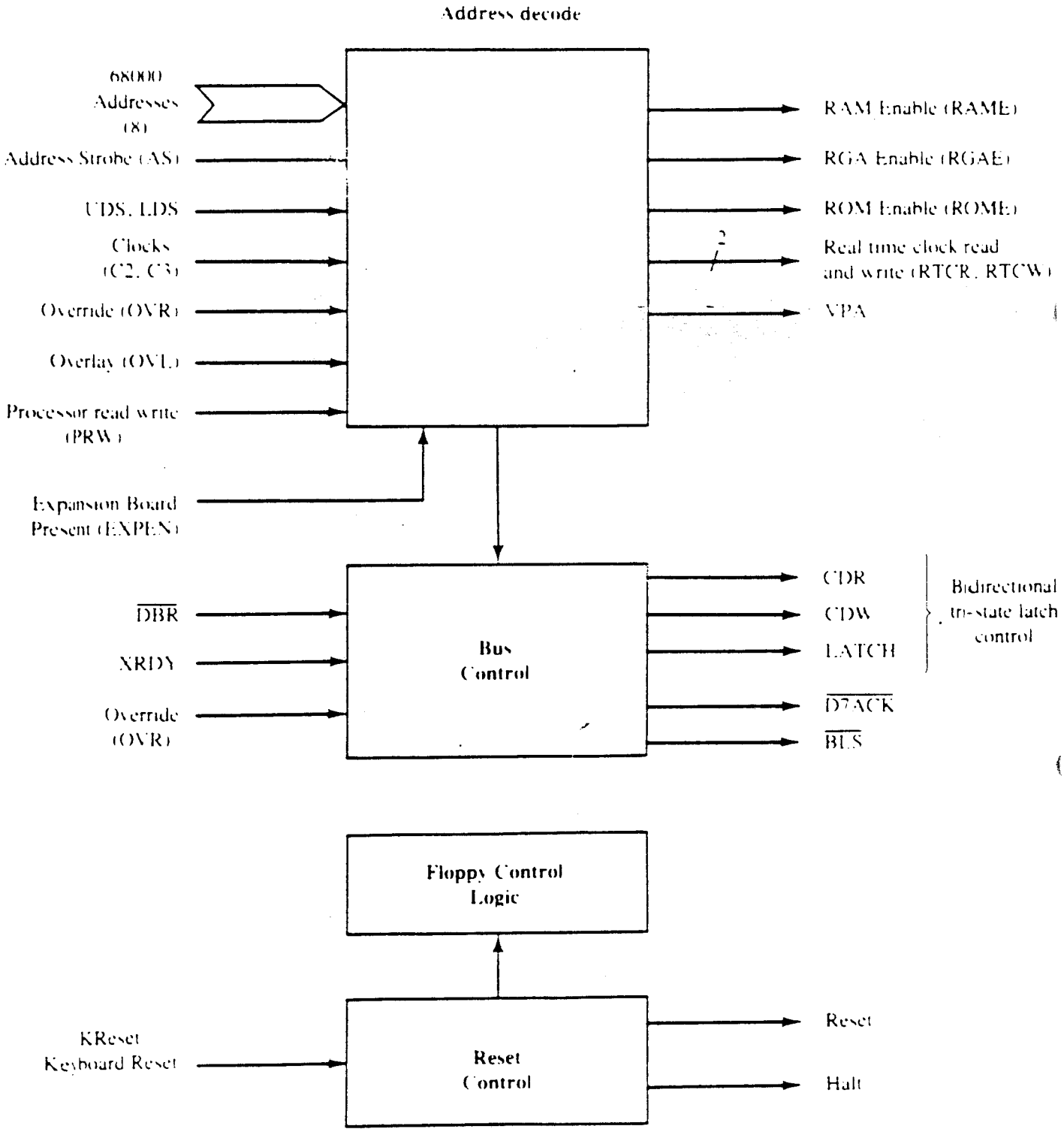
Custom Control Chip
Gary



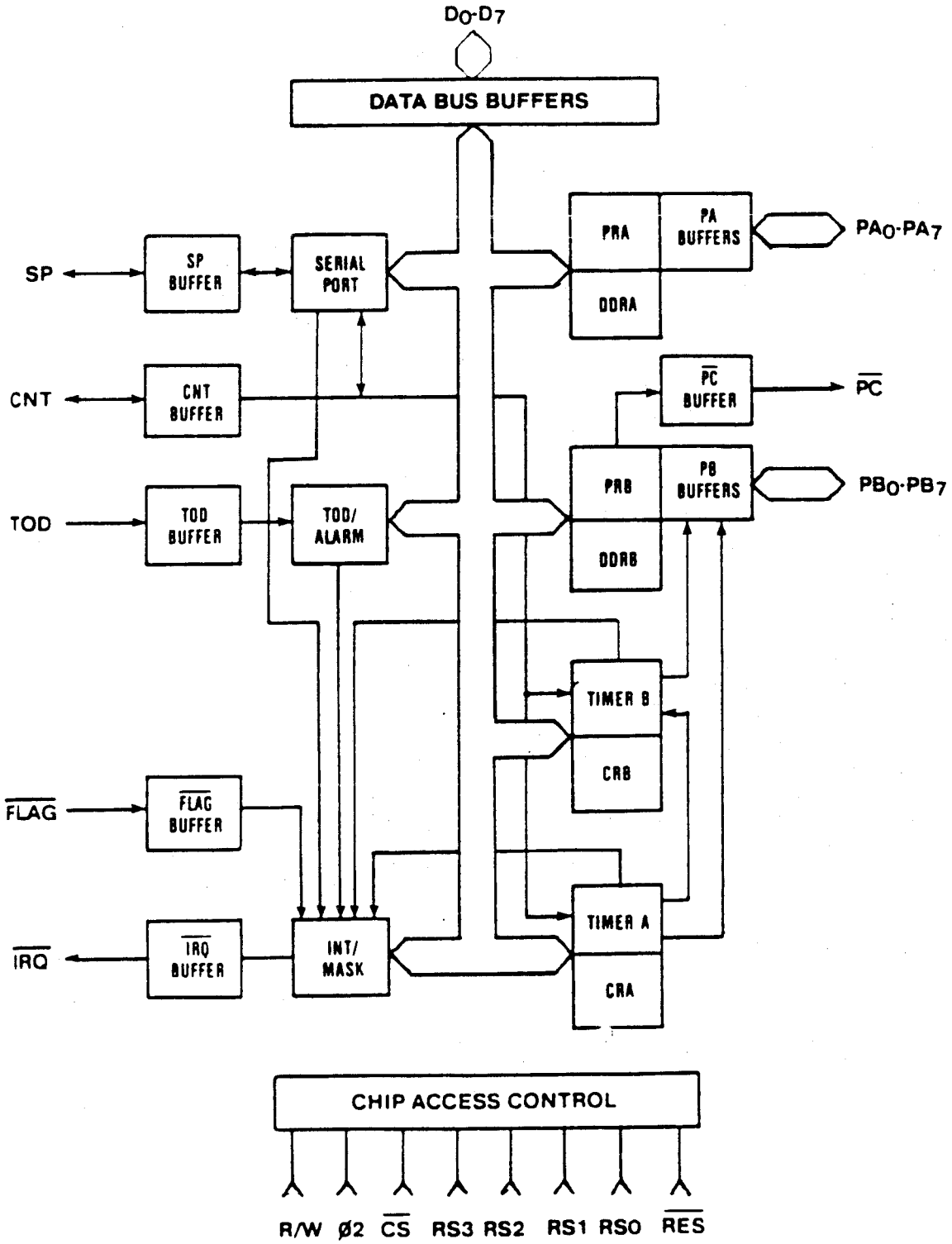
Features:

- Provides all bus control signals.
- Provides all address decoding.
- Generates the 68000 VPA signal.
- Handles some of the floppy circuitry.
- Provides keyboard reset interface.

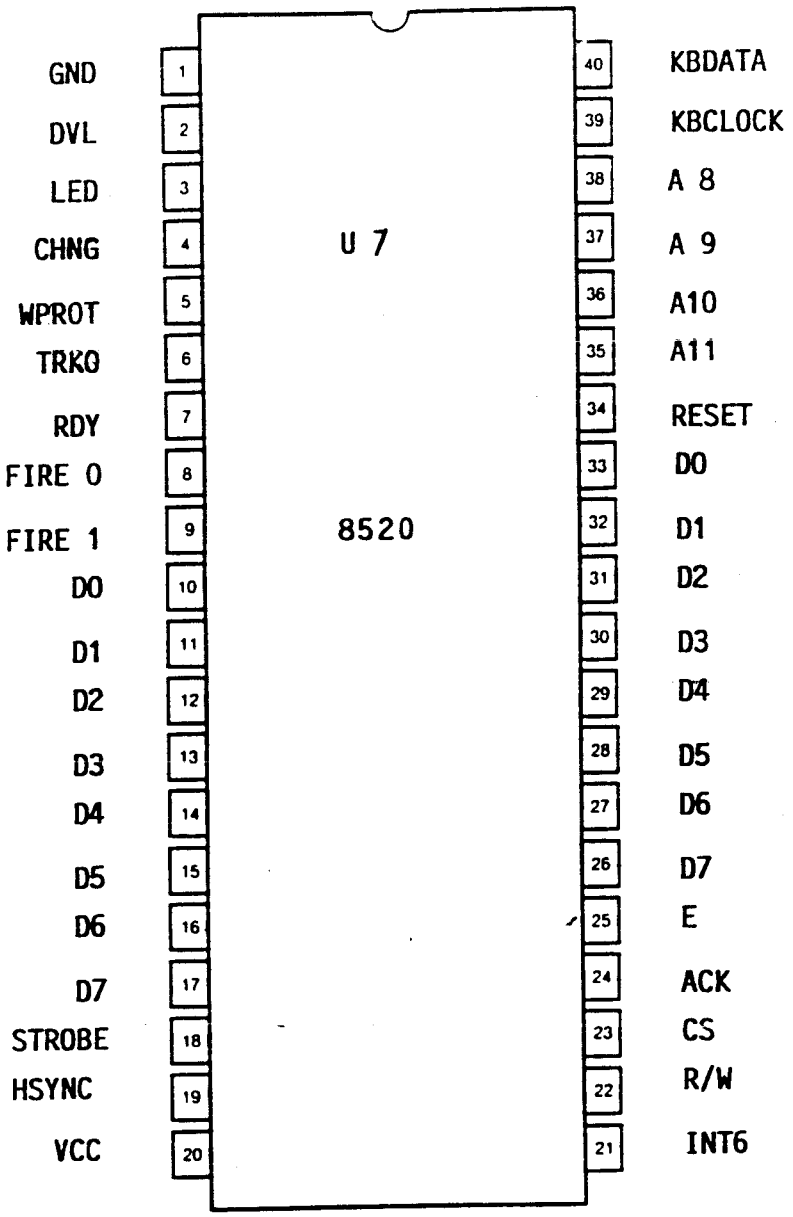
Gary Block Diagram



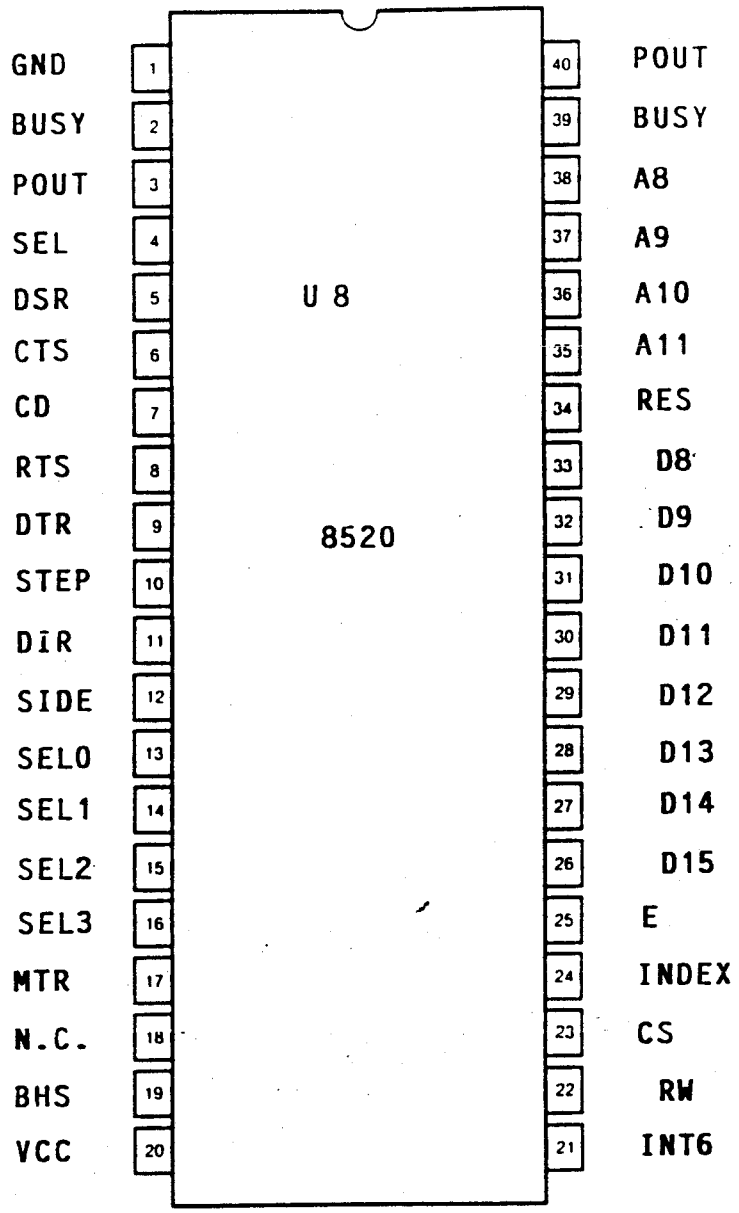
Allgemeines Blockdiagramm Portbausteine 8520



— PORT 8520 —

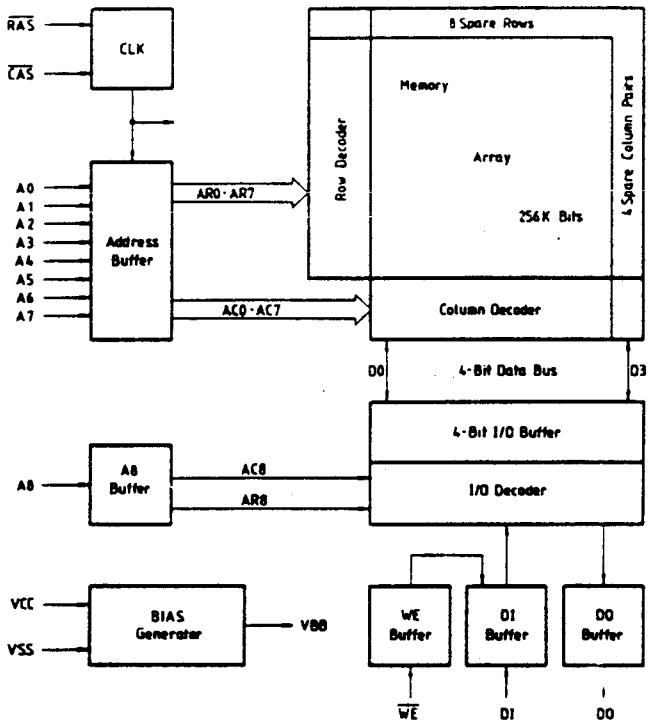

U 7
8520
GND 1
DVL 2
LED 3
CHNG 4
WPROT 5
TRK0 6
RDY 7
FIRE 0 8
FIRE 1 9
D0 10
D1 11
D2 12
D3 13
D4 14
D5 15
D6 16
D7 17
STROBE 18
HSYNC 19
VCC 20
40 KBDATA
39 KBCLOCK
38 A 8
37 A 9
36 A10
35 A11
34 RESET
33 D0
32 D1
31 D2
30 D3
29 D4
28 D5
27 D6
26 D7
25 E
24 ACK
23 CS
22 R/W
21 INT6

— PORT 8520 —

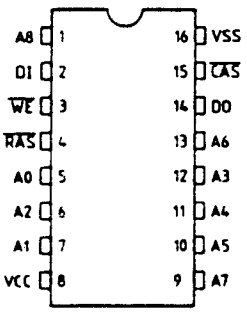

GND 1
BUSY 2
POUT 3
SEL 4
DSR 5
CTS 6
CD 7
RTS 8
DTR 9
STEP 10
DIR 11
SIDE 12
SEL0 13
SEL1 14
SEL2 15
SEL3 16
MTR 17
N.C. 18
BHS 19
VCC 20
U 8
8520
40 POUT
39 BUSY
38 A8
37 A9
36 A10
35 A11
34 RES
33 D8
32 D9
31 D10
30 D11
29 D12
28 D13
27 D14
26 D15
25 E
24 INDEX
23 CS
22 RW
21 INT6

– 256 K * 1 DRAM –

a) Block-Diagramm



b) Pin-Belegung



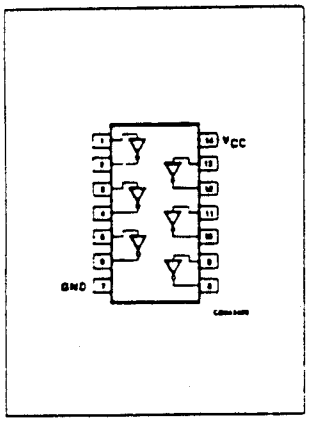
Pin names

A0-A8	Address Inputs
$\overline{CAS}$	Column Address Strobe
DI	Data In
DO	Data Out
$\overline{RAS}$	Row Address Strobe
$\overline{WE}$	Write Enable
VCC	Power Supply (+5V)
VSS	Ground (0V)

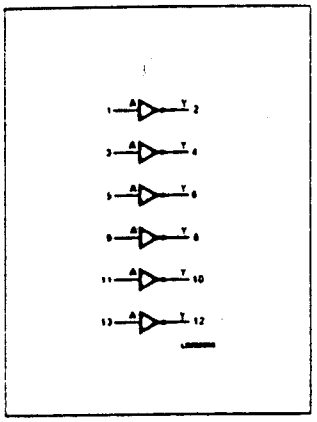
Commodore

74 LS 04 Inverter

PIN CONFIGURATION



LOGIC SYMBOL



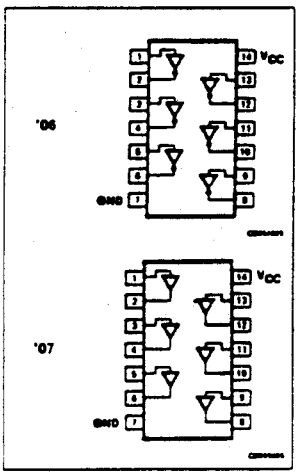
FUNCTION TABLE

INPUT	OUTPUT
A	Y
L	H
H	L

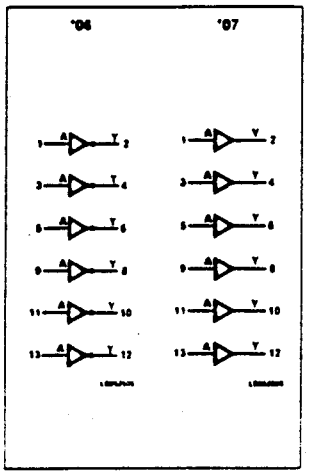
H = HIGH voltage level
L = LOW voltage level

7407 Buffer

PIN CONFIGURATION



LOGIC SYMBOL



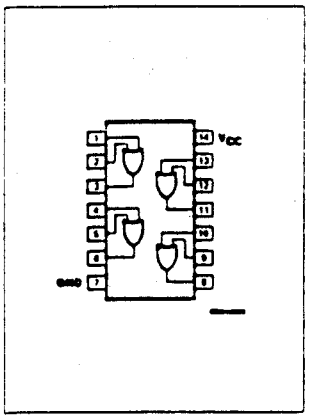
FUNCTION TABLE

'06		'07	
INPUT	OUTPUT	INPUT	OUTPUT
A	Y	A	Y
H	L	H	H
L	H	L	L

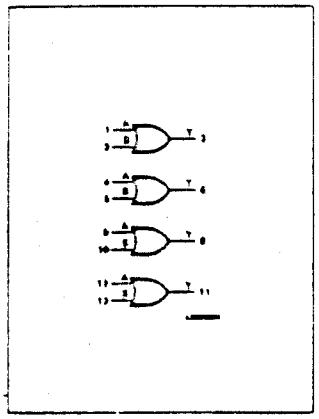
H = HIGH voltage level
L = LOW voltage level

74 LS 32 Or Gate

PIN CONFIGURATION



LOGIC SYMBOL



FUNCTION TABLE

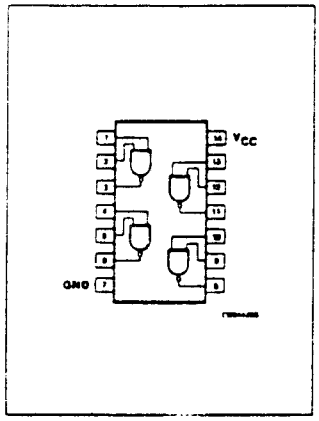
INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	H

H = HIGH voltage level
L = LOW voltage level

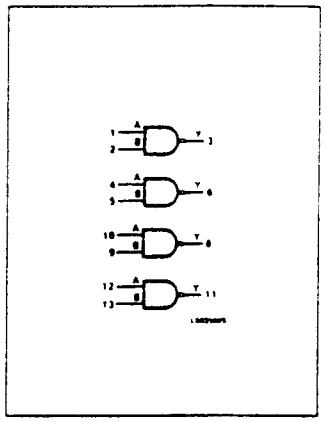
Commodore

74 38 Nand Buffer

PIN CONFIGURATION



LOGIC SYMBOL



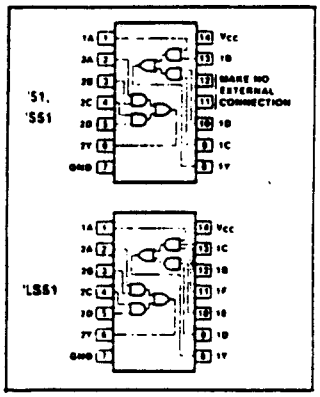
FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

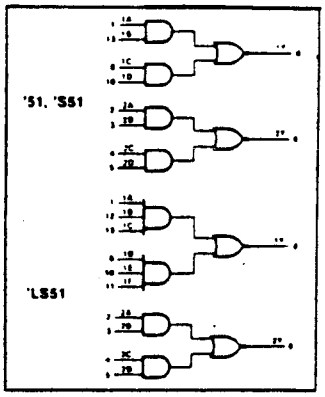
H = HIGH voltage level
L = LOW voltage level

74 S 51 2Input And-Or-Gate

PIN CONFIGURATION



LOGIC SYMBOL



FUNCTION TABLE
'S1, 'S51, ½ 'LS51

INPUTS				OUTPUT
A	B	C	D	Y
H	H	X	X	L
X	X	H	H	L
All other combinations				H

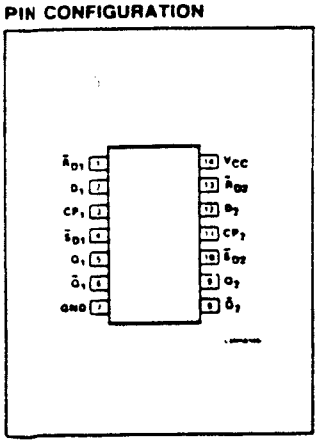
'LS51

INPUTS						OUTPUT
A	B	C	D	E	F	Y
H	H	H	X	X	X	L
X	X	X	H	H	H	L
All other combinations						H

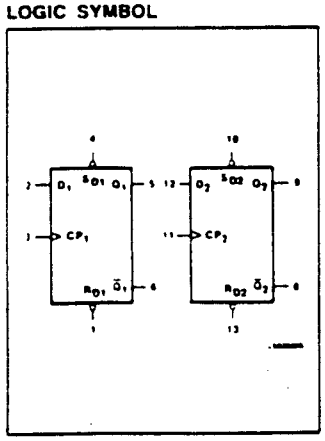
H = HIGH voltage level
L = LOW voltage level
X = Don't care

74 LS 74 Dual D-Type Flip-Flop

PIN CONFIGURATION



LOGIC SYMBOL



MODE SELECT — FUNCTION TABLE

OPERATING MODE	INPUTS				OUTPUTS	
	$\bar{S}_D$	$\bar{R}_D$	CP	D	Q	$\bar{Q}$
Asynchronous Set	L	H	X	X	H	L
Asynchronous Reset (Clear)	H	L	X	X	L	H
Undetermined[1]	L	L	X	X	H	H
Load "1" (Set)	H	H	↑	h	H	L
Load "0" (Reset)	H	H	↑	l	L	H

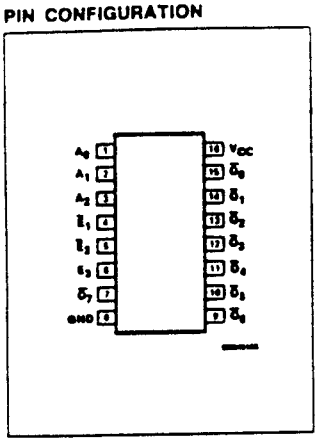
H = HIGH voltage level steady state
h = HIGH voltage level one set-up time prior to the LOW-to-HIGH clock transition
L = LOW voltage level steady state
l = LOW voltage level one set-up time prior to the LOW-to-HIGH clock transition
X = Don't care
↑ = LOW-to-HIGH clock transition

NOTE:
(1) Both outputs will be HIGH while both $\bar{S}_D$ and $\bar{R}_D$ are LOW, but the output states are unpredictable if $\bar{S}_D$ and $\bar{R}_D$ go HIGH simultaneously

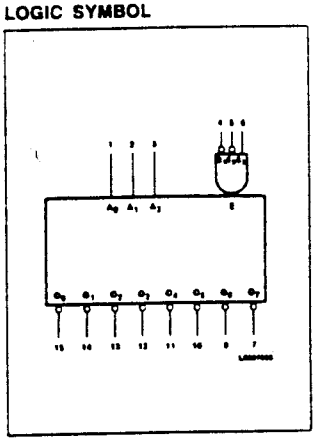
Commodore

74 LS 138 — 1 of 8 Decoder / Demultiplexer

PIN CONFIGURATION



LOGIC SYMBOL



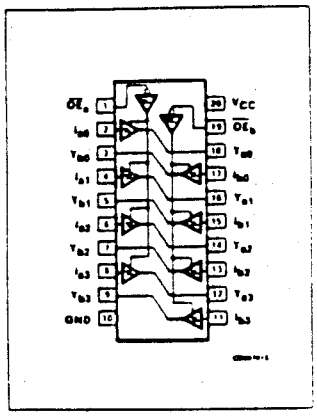
FUNCTION TABLE

INPUTS						OUTPUTS							
E_1	E_2	E_3	A_0	A_1	A_2	$\overline{0}$	$\overline{1}$	$\overline{2}$	$\overline{3}$	$\overline{4}$	$\overline{5}$	$\overline{6}$	$\overline{7}$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	H	H	H	H	H
L	L	H	H	L	L	H	L	H	H	H	H	H	H
L	L	H	L	H	L	H	H	L	H	H	H	H	H
L	L	H	H	H	L	H	H	H	L	H	H	H	H
L	L	H	L	L	H	H	H	H	H	L	H	H	H
L	L	H	H	L	H	H	H	H	H	H	L	H	H
L	L	H	L	H	H	H	H	H	H	H	H	L	H
L	L	H	H	H	H	H	H	H	H	H	H	H	L

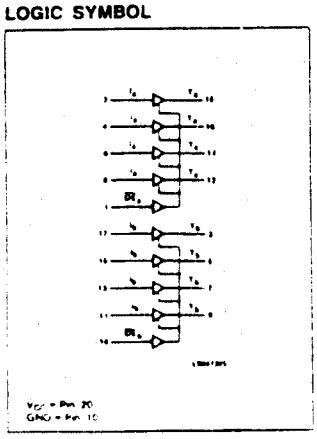
H = HIGH voltage level
L = LOW voltage level
X = Don't care

74 LS 244 — Octal Buffer

PIN CONFIGURATION



LOGIC SYMBOL



FUNCTION TABLE

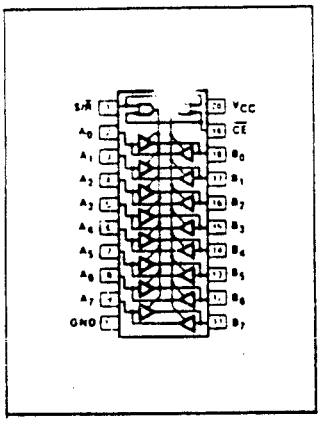
INPUTS				OUTPUTS	
$\overline{OE}_a$	I_a	$\overline{OE}_b$	I_b	Y_a	Y_b
L	L	L	L	L	L
L	H	L	H	H	H
H	X	H	X	(Z)	(Z)

H = HIGH voltage level
L = LOW voltage level
X = Don't care
(Z) = HIGH impedance (off) state

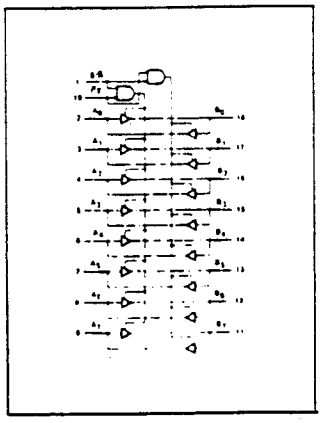
Commodore

74 LS 245 Octal Transceiver

PIN CONFIGURATION



LOGIC SYMBOL



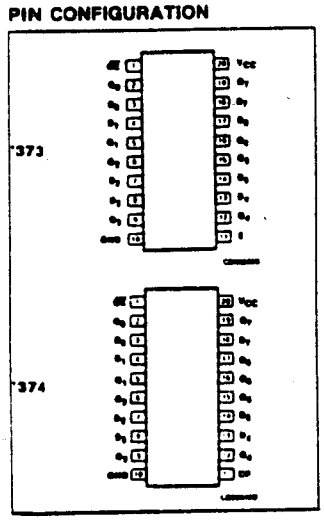
FUNCTION TABLE

INPUTS		INPUTS/OUTPUTS	
$\overline{CE}$	S/$\overline{R}$	A_n	B_n
L	L	A = B	INPUTS
L	H	INPUT	B = A
H	X	(Z)	(Z)

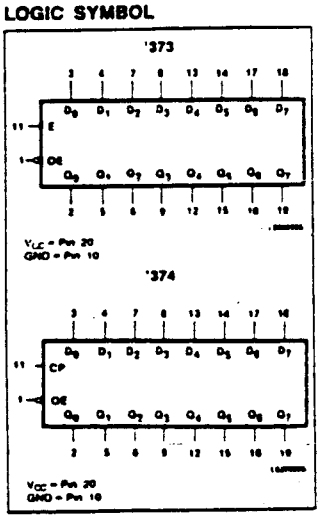
H = HIGH voltage level
L = LOW voltage level
X = Don't care
(Z) = HIGH impedance "off" state

74 LS 373/374 Latch

PIN CONFIGURATION



LOGIC SYMBOL



MODE SELECT — FUNCTION TABLE '373

OPERATING MODES	INPUTS			INTERNAL REGISTER	OUTPUTS
	$\overline{OE}$	E	D_n		$Q_0 - Q_7$
Enable and read register	L L	H H	L H	L H	L H
Latch and read register	L L	L L	l h	L H	L H
Latch register and disable outputs	H H	L L	l h	L H	(Z) (Z)

MODE SELECT — FUNCTION TABLE '374

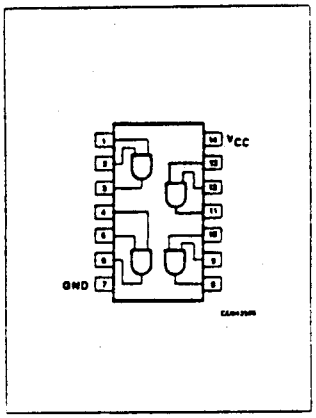
OPERATING MODES	INPUTS			INTERNAL REGISTER	OUTPUTS
	$\overline{OE}$	CP	D_n		$Q_0 - Q_7$
Load and read register	L L	↑ ↑	l h	L H	L H
Load register and disable outputs	H H	↑ ↑	l h	L H	(Z) (Z)

H = HIGH voltage level
h = HIGH voltage level one set-up time prior to the LOW-to-HIGH clock transition or HIGH-to-LOW $\overline{OE}$ transition
L = LOW voltage level
l = LOW voltage level one set-up time prior to the LOW-to-HIGH clock transition or HIGH-to-LOW $\overline{OE}$ transition
(Z) = HIGH impedance "off" state
↑ = LOW-to-HIGH clock transition

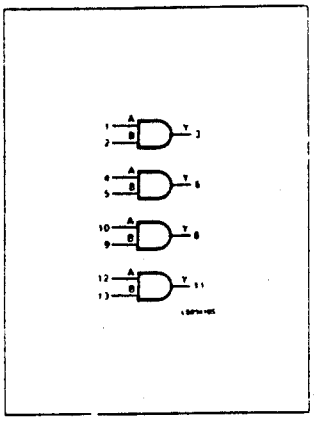
Commodore

74 F 08 And Gate

PIN CONFIGURATION



LOGIC SYMBOL



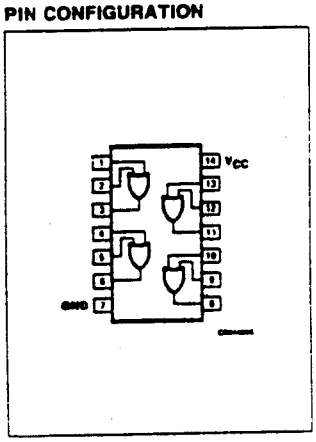
FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

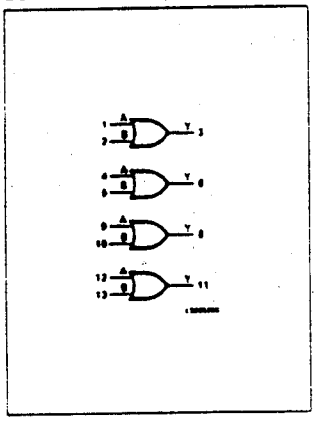
H = HIGH voltage level
L = LOW voltage level

74 F 32 Or Gate

PIN CONFIGURATION



LOGIC SYMBOL



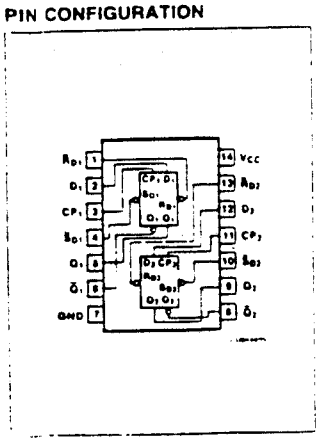
FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	H

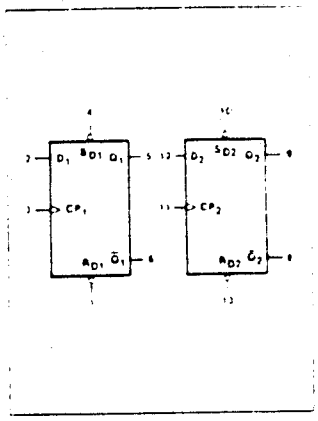
H = HIGH voltage level
L = LOW voltage level

74 F 74 Dual D-Type Flip-Flop

PIN CONFIGURATION



LOGIC SYMBOL



MODE SELECT — FUNCTION TABLE

OPERATING MODE	INPUTS				OUTPUTS	
	$\overline{S}_D$	$\overline{R}_D$	CP	D	Q	$\overline{Q}$
Asynchronous Set	L	H	X	X	H	L
Asynchronous Reset (Clear)	H	L	X	X	L	H
Undetermined[1]	L	L	x	x	H	H
Load "1" (Set)	H	H	↑	h	H	L
Load "0" (Reset)	H	H	↑	l	L	H

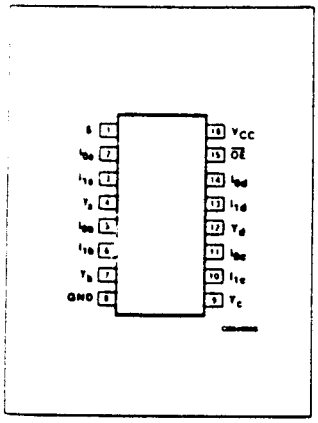
H = HIGH voltage level steady state
h = HIGH voltage level one set-up time prior to the LOW-to-HIGH clock transition
L = LOW voltage level steady state
l = LOW voltage level one set up time prior to the LOW to HIGH clock transition
x = Don't care
↑ = LOW-to-HIGH clock transition

NOTE
(1) Both outputs will be HIGH if both $\overline{S}_D$ and $\overline{R}_D$ go OW simultaneously

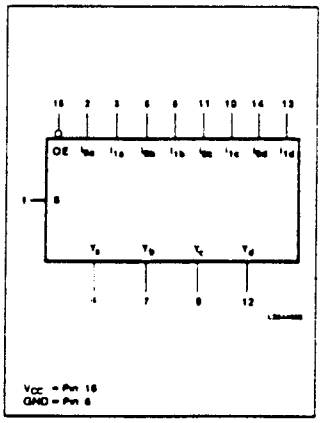
Commodore

74 F 257 2Line to 1Line Multiplexer

PIN CONFIGURATION



LOGIC SYMBOL



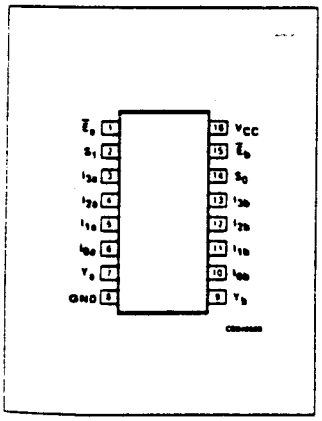
FUNCTION TABLE

INPUTS				OUTPUT
$\overline{OE}$	S	I_0	I_1	Y
H	X	X	X	(Z)
L	H	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	H	X	H

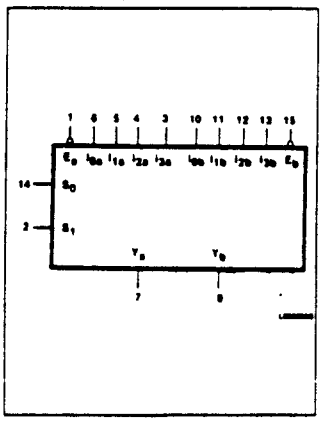
H = HIGH voltage level
L = LOW voltage level
X = Don't care
(Z) = HIGH impedance (off) state

74 F 153 4Line to 1Line Multiplexer

PIN CONFIGURATION



LOGIC SYMBOL



FUNCTION TABLE

SELECTS INPUTS		INPUTS (a or b)					OUTPUT
S_0	S_1	$\overline{E}$	I_0	I_1	I_2	I_3	Y
X	X	H	X	X	X	X	L
L	L	L	L	X	X	X	L
L	L	L	H	X	X	X	H
H	L	L	X	L	X	X	L
H	L	L	X	H	X	X	H
L	H	L	X	X	L	X	L
L	H	L	X	X	H	X	H
H	H	L	X	X	X	L	L
H	H	L	X	X	X	H	H

H = HIGH voltage level
L = LOW voltage level
X = Don't care

Commodore

74 HCT 32 Or Gate

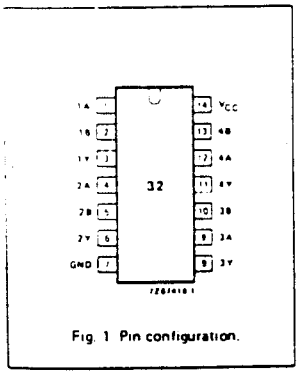


Fig. 1 Pin configuration.

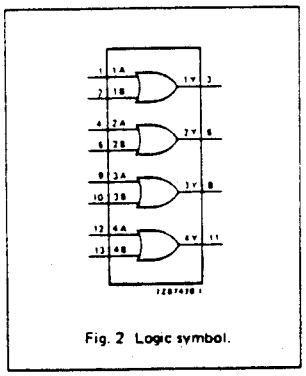


Fig. 2 Logic symbol.

FUNCTION TABLE

INPUTS		OUTPUT
nA	nB	nY
L	L	L
L	H	H
H	L	H
H	H	H

H = HIGH voltage level
L = LOW voltage level

74 HCT 157 2line to 1line Multiplexer

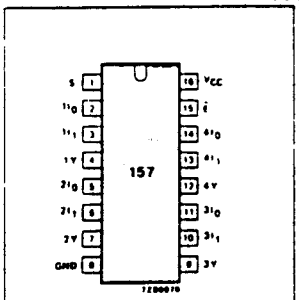


Fig. 1 Pin configuration.

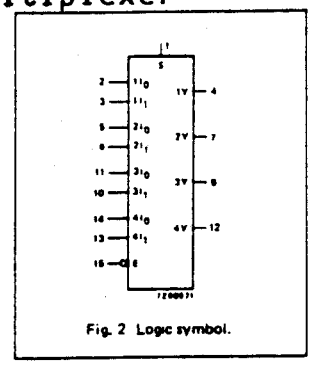


Fig. 2 Logic symbol.

FUNCTION TABLE

INPUTS				OUTPUT
$\overline{E}$	S	nI_0	nI_1	nY
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

H = HIGH voltage level
L = LOW voltage level
X = don't care

74 HC 244 Octal Buffer

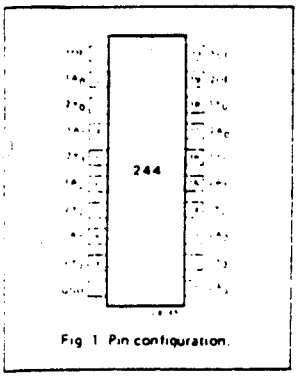


Fig. 1 Pin configuration.

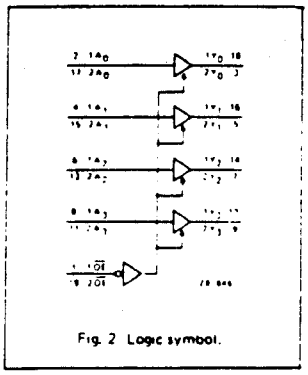


Fig. 2 Logic symbol.

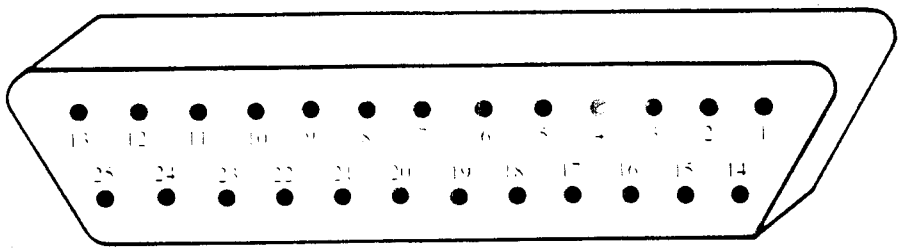
FUNCTION TABLE

INPUTS		OUTPUT
$n\overline{OE}$	nA_n	nY_n
L	L	L
L	H	H
H	X	Z

H = HIGH voltage level
L = LOW voltage level
X = don't care
Z = high impedance OFF-state

Serial Connector

In the following table, the second column from the left gives the Amiga pin assignments. The third and fourth columns from the left give pin assignments for other commonly used connections; the information in these two columns is given for comparison only.



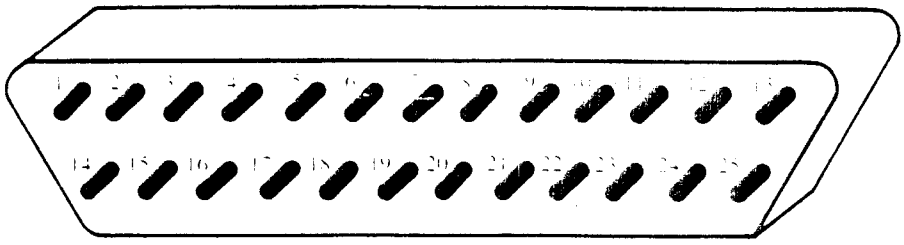
WARNING: Pins 9 and 10 on the Amiga serial connector are used for external power. Connect these pins ONLY if power from them is required by the external device. The table lists the power provided by each of these pins.

Pin	Amiga 500	RS232	HAYES®	Description
1	GND	GND	GND	FRAME GROUND
2	TXD	TXD	TXD	TRANSMIT DATA
3	RXD	RXD	RXD	RECEIVE DATA
4	RTS	RTS		REQUEST TO SEND
5	CTS	CTS	CTS	CLEAR TO SEND
6	DSR	DSR	DSR	DATA SET READY
7	GND	GND	GND	SYSTEM GROUND
8	DCD	DCD	DCD	CARRIER DETECT
9	+12V			+12 VOLT CARRIER
10	−12V			−12 VOLT CARRIER
11	AUDO			AUDIO OUT OF AMIGA
12		S.SD	SI	SPEED INDICATE
13		S.CTS		
14		S.TXD		
15		TXC		
16		S.RXD		
17		RXC		
18	AUDI			AUDIO INTO AMIGA
19		S.RTS		
20	DTR	DTR	DTR	DATA TERMINAL READY
21		SQD		
22	RI	RI	RI	RING INDICATOR
23		SS		
24		TXC1		
25				

Signalbeschreibung der seriellen Schnittstelle

Signalname	Signalrichtung	Bedeutung
TxD	Ausgang	Transmit Data Sendedaten vom PC zur Peripherie
RxD	Eingang	Receive Data Emfangsdaten von der Peripherie zum PC
DSR	Eingang	Data Set Ready Zeigt an, daß ein Peripheriegerät betriebsbereit ist.
CTS	Eingang	Clear to Send zeigt an, daß ein Peripheriegerät empfangsbereit ist.
DTR	Ausgang	Data Terminal Ready zeigt dem Peripheriegerät, daß die serielle Schnittstelle des PC betriebsbereit ist (siehe auch DSR)
RTS	Ausgang	Request to Send Zeigt dem Peripheriegerät an, daß die serielle Schnittstelle, des PC Daten senden will (Siehe auch CTS)
CD	Eingang	Carrier Detect Modemsignal. Es zeigt an, daß ein angeschlossenes Modem einen Träger empfängt.

A500 Parallel Connector



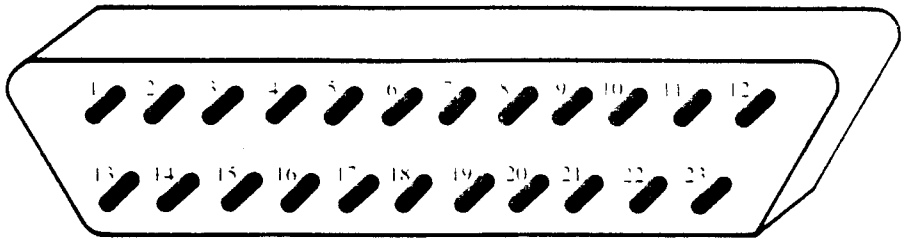
WARNING: Pin 14 on the Amiga parallel connector supplies +5 volts of power. Connect this pin ONLY if the power from it is required by the external device. NEVER connect this pin to an output of an external device or to a signal ground. Pins 17-25 are for grounding signals. DO NOT connect these pins directly to a shield ground.

Pin	Name	Description
1	STROBE*	STROBE
2	D0	DATA BIT 0 (Least sign. bit)
3	D1	DATA BIT 1
4	D2	DATA BIT 2
5	D3	DATA BIT 3
6	D4	DATA BIT 4
7	D5	DATA BIT 5
8	D6	DATA BIT 6
9	D7	DATA BIT 7
10	ACK*	ACKNOWLEDGE
11	BUSY	BUSY
12	POUT	PAPER OUT
13	SEL	SELECT
14	+5V PULLUP	+5 VOLTS POWER (100 mA)
15	NC	NO CONNECTION
16	RESET*	RESET
17	GND	SIGNAL GROUND
18	GND	SIGNAL GROUND
19	GND	SIGNAL GROUND
20	GND	SIGNAL GROUND
21	GND	SIGNAL GROUND
22	GND	SIGNAL GROUND
23	GND	SIGNAL GROUND
24	GND	SIGNAL GROUND
25	GND	SIGNAL GROUND

Signalbeschreibung der Centronics-Schnittstelle

DRDY	Dieses Signal wird aktiv, wenn die Daten (Data 0-7) stabil sind. Es weist den Drucker an, die anliegenden Daten zu übernehmen. Das Signal ist normalerweise High und wird LOW, wenn Daten übernommen werden sollen (LOW aktiv).
BUSY	Wenn der Drucker keine Daten übernehmen kann, aktiviert er dieses Signal (HIGH aktiv). In folgenden Fällen tritt dieser Zustand ein: 1. Kurz nach der Datenübernahme 2. Während des Druckvorganges 3. Drucker nicht bereit (Off-Line) 4. Wenn der Drucker gestört ist
ACK	Dieses Signal stellt die Quittung dar, daß die Daten vom Drucker übernommen worden sind und er bereit ist, neue Daten zu empfangen (LOW aktiv).
POUT	Dieses Signal meldet, daß kein Papier mehr im Drucker vorhanden worden ist (High aktiv).
SLCT	Dieses Signal quittiert, daß der Drucker ausgewählt worden ist (High aktiv)
DATA 0-7	Auf diesen Leitungen werden die Informationen (8 Bit) parllel übertragen: HIGH Pegel bei logisch *1* LOW Pegel bei logisch *0*

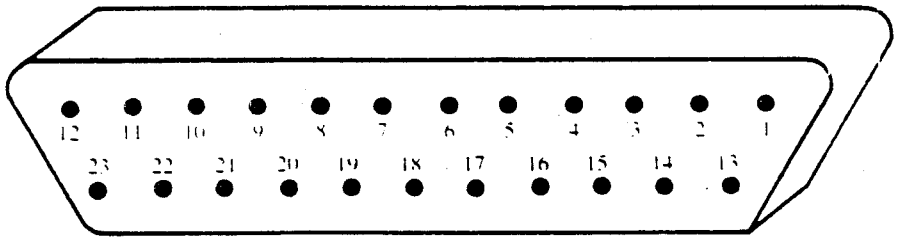
RGB Monito · Connector



WARNING: Pins 21, 22, and 23 on the RGB monitor connector are used for external power. Connect these pins ONLY if power from them is required by the external device. The table lists the power provided by each of these pins.

Pin	Name	Description
1	XCLK*	EXTERNAL CLOCK
2	XCLKEN*	EXTERNAL CLOCK ENABLE
3	RED	ANALOG RED
4	GREEN	ANALOG GREEN
5	BLUE	ANALOG BLUE
6	DI	DIGITAL INTENSITY
7	DB	DIGITAL BLUE
8	DG	DIGITAL GREEN
9	DR	DIGITAL RED
10	CSYNC*	COMPOSITE SYNC
11	HSYNC*	HORIZONTAL SYNC
12	VSYNC*	VERTICAL SYNC
13	GNDRTN	RETURN FOR XCLKEN*
14	ZD*	ZERO DETECT
15	C1*	CLOCK OUT
16	GND	GROUND
17	GND	GROUND
18	GND	GROUND
19	GND	GROUND
20	GND	GROUND
21	− 12V	− 12 VOLTS POWER (50 mA)
22	+ 12V	+ 12 VOLTS POWER (100 mA)
23	+ 5V	+ 5 VOLTS POWER (100 mA)

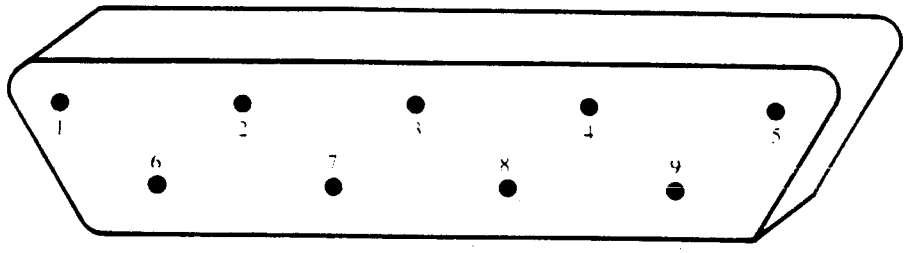
External Disk Connector



Pin	Name	Description
1	/RDY	Disk Ready—Active Low
2	/DKRD	Disk Ready Data—Active Low
3-7	GND	Ground
8	/MTRXD	Disk Motor Control—Active Low
9	/SEL2B	Select Drive 2—Active Low
10	/DRESB	Disk RESET—Active Low
11	/CHNG	Disk has been Removed from Drive—Latched Low
12	+5	5 VDC Supply
13	/SIDEB	Select Disk Side—0 = Upper 1 = Lower
14	/WPRO	Disk is Write Protected—Active Low
15	/TKO	Drive Head Position over Track 0—Active Low
16	/DKWE	Disk Write Enable—Active Low
17	/DKWD	Disk Write Data—Active Low
18	/STEPB	Step the Head—Pulse, First Low then High
19	DIRB	Select Head Direction—0 = Inner 1 = Outer
20	/SEL3B	Select Drive 3—Active Low
21	/SEL1B	Select Drive 1—Active Low
22	/INDEX	Disk Index Pulse—Active Low
23	+12	12 VDC Supply

Mouse/Game Controller Connectors

There are connectors labeled "JOY1" and "JOY2" on the back of the Amiga 500. If you use a mouse to control the Workbench, you must attach it to connector JOY 1. You can attach joystick controllers to either of the connectors. To use a light pen, you must attach it to connector 1. The following tables describe mouse, game controller, and light pen connections.



WARNING: Pin 7 on each of these connectors supplies +5 volts of power. Connect this pin ONLY if power from it is required by the external device.

Connectors 1 and 2: Mouse Connections

Pin	Name	Description
1	MOUSE V	MOUSE VERTICAL
2	MOUSE H	MOUSE HORIZONTAL
3	MOUSE VQ	VERTICAL QUADRATURE
4	MOUSE HQ	HORIZONTAL QUADRATURE
5	MOUSE BUTTON 2	MOUSE BUTTON 2
6	MOUSE BUTTON 1	MOUSE BUTTON 1
7	+5V	+5 VOLTS POWER (100 mA)
8	GND	GROUND
9	MOUSE BUTTON 3	MOUSE BUTTON 3

Connectors 1 and 2: Game Controller

Pin	Name	Description
1	FORWARD*	CONTROLLER FORWARD
2	BACK*	CONTROLLER BACK
3	LEFT*	CONTROLLER LEFT
4	RIGHT*	CONTROLLER RIGHT
5	POT X	HORIZONTAL POTENTIOMETER
6	FIRE*	CONTROLLER FIRE
7	+5V	+5 VOLTS POWER (100 mA)
8	GND	GROUND
9	POT Y	VERTICAL POTENTIOMETER

Connector 2: Light Pen Connection

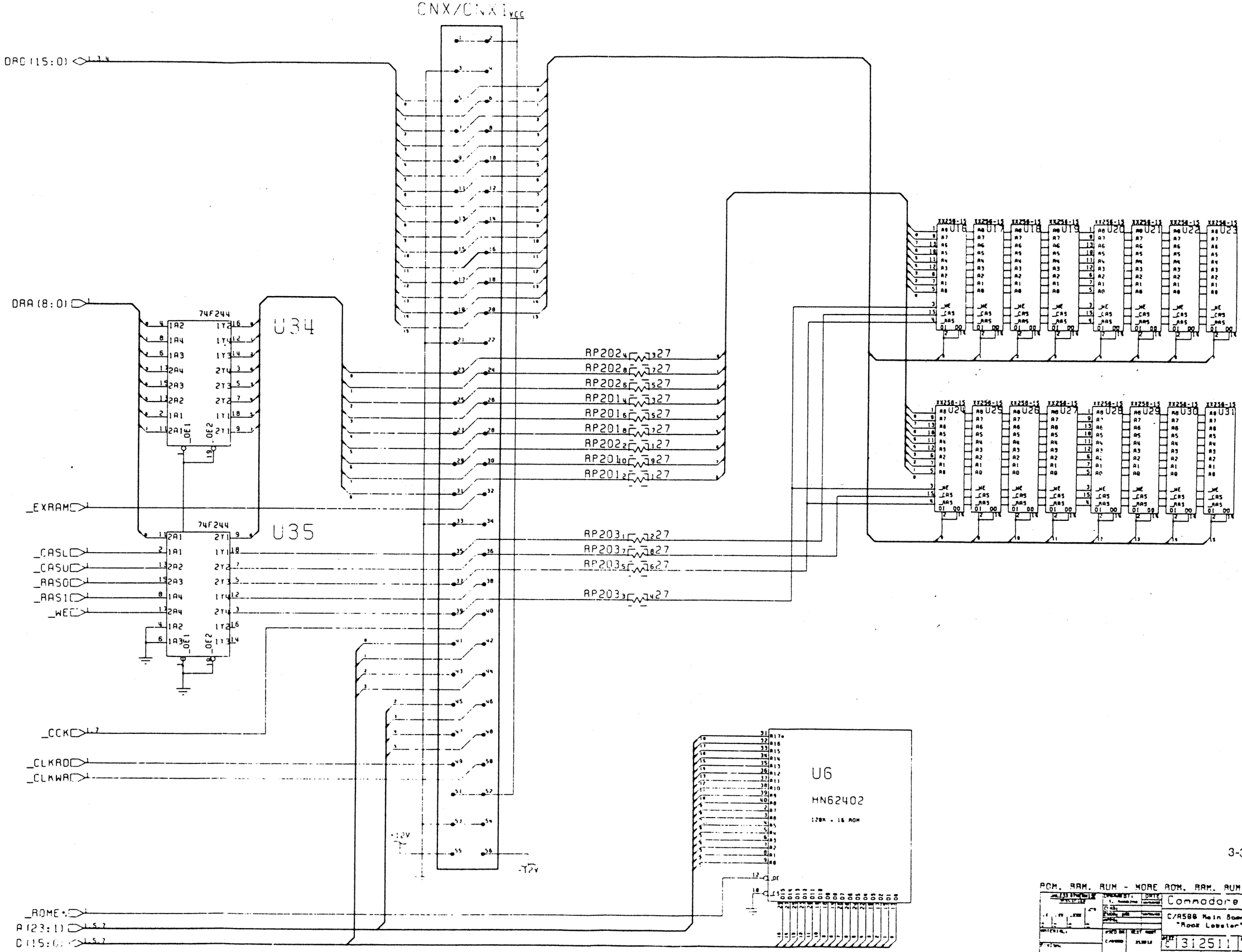
Pin	Name	Description
1		
2		
3		
4		
5	LIGHT PEN PRESS	LIGHT PEN TOUCHED TO SCREEN
6	LIGHT PEN*	CAPTURE BEAM POSITION
7	+5V	+5 VOLTS POWER (100 mA)
8	GND	GROUND
9		

36-Pin Connector

Pin	Name	Pin	Name
1	gnd	44	IPL2*
2	gnd	45	A16
3	gnd	46	BERR*
4	gnd	47	A17
5	+5	48	VPA*
6	+5	49	gnd
7	exp	50	E
8	−12	51	VMA*
9	exp	52	A18
10	+12	53	RES*
11	exp	54	A19
12	CONFIG*	55	HLT*
13		56	A20
14	C[illegible]	57	A22
15	CDAC	58	A21
16	C1*	59	A23
17	OVR*	60	BR*
18	XRDY	61	gnd
19	INT2*	62	BGACK*
20	PALOPE*	63	PD15
21	A5	64	BG*
22	INT6*	65	PD14
23	A6	66	DTACK*
24	A4	67	PD13
25	gnd	68	PRW*
26	A3	69	PD12
27	A2	70	LDS*
28	A7	71	PD11
29	A1	72	UDS*
30	A8	73	gnd
31	FC0	74	AS*
32	A9	75	PD0
33	FC1	76	PD10
34	A10	77	PD1
35	FC2	78	PD9
36	A11	79	PD2
37	gnd	80	PD8
38	A12	81	PD3
39	A13	82	PD7
40	IPL0*	83	PD4
41	A14	84	PD6
42	IPL1*	85	gnd
43	A15	86	PD5

TECHNISCHE DATEN

CPU:	Motorola 68000, 16(32) bit, 7,14 Mhz
Co-Prozessoren:	3 Amiga-Spezialprozessoren für DMA, Video, Graphik/Sound
Speicherkapazität: (insgesamt)	Grundversion - 0,75 MB, davon 0,5 MB RAM Arbeitsspeicher und 256 KB ROM für Kickstart 1.2 - Arbeitsspeicher intern über Steckkarte um 512 KB erweitert werden
Massenspeicher:	intern - Grundversion 1 x 3 1/2" Floppy Disk, 880 KB formatiert - optional externe Floppy Disks
Schnittstellen:	seriell - programmierbare RS 232 C bis 31250 Baud, Midi über Adapter parallel - programmierbar, normalerweise als Centronics konfiguriert Controller-Ports - 2 Ports für Maus, Graphiktabletts, Light Pen, Drehregler Video/Audio - 2 Ports/Cynch Stereo/Audio, RGB analog/ digital
Sprache/Sound:	Ausgabe - über eingebauten Lautsprecher oder externe Tonquellen, 4 getrennte Soundkanäle auf 2 Stereo-Kanälen konfiguriert - 4 D/A-Wandler eingebaut Eingabe - von beliebigen Audioquellen über Digitalisierung, Naturstimmen über Mikrophon
Video:	Eingabe / Ausgabe - über Genlock-Interface/Bildbe- und verarbeitung über Digitalisiereinheit - von beliebigen Videoquellen, wie Kamera, Bildplatte, Fernseher, Bildschirmtext, Scanner - Einbindung in Multitasking Graphik/Textmodus - Graphik 320 x 256, 320 x 512, 640 x 256, 640 x 512 - Text wahlweise 60 oder 80 Zeichen breit, zu 32 Zeilen in Farbe, verschiedene Schriftzeichen unterschiedlicher Größe und Art, Bildschirmfarben von Benutzer definierbar Video-Display - 625 Zeilen vertikal, Frequenz 50 Hz, Videospeicher 512 KB
Betriebssystem:	Amiga-DOS, Multitasking
Monitor:	Farbmonitor, in Grundversion nicht enthalten, Anschluß an Farbfernseher über externen zusätzlichen PAL-Coder
Eingabemedien:	integrierte Tastatur mit 96 Tasten, separater Rechenblock, Funktionstasten, Maus mit 2 Bedienungsknöpfen



ROM, RAM, RUM - MORE ROM, RAM, RUM!

Commodore

C/A586 Main Board "Rook Labeler"

312511

Note: U32 and JP2 are mutually exclusive

U32

74F74

CCKQ

CDAC

JP2

U1

68000

U12

74F244

74LS373

U13

U10

74F244

74LS373

U11

U5

GARY

(FLOPPY FUNCTIONS)

(CONTROL FUNCTIONS)

U2

8370

Fat Agnus

RP102 4.7Kx9

RP104 470x7

RP101 7Kx9

RP103 27-

RP105 4.7Kx9

RP:03 27-

TP2

_BR
_BG
_BGACK
_BEER
7MHz
E
_IPL(2:0)
_FC(2:0)
_DTACK
_VMA
_VPA
_AS
R_W
_UDS
_LDS
_RST
_HLT

_DVR
_OVL
XRDY
_ROMEN
_EXRAM
_CLKRD
_CLKWR
74FQ04
_CCKQ
_CCK
CDAC
_CASL
_CASU
_RAS0
_RAS1
_WE
DRA(8:0)
RGA(8:1)
7MHz
_FIRE1
_HSYNC
_VSYNC
_CSYNC
TEST

DMAL
_INT3

28MHz
_XCLKEN
XCLK

D(15:0)
DRD(15:0)

3-36

PROCESSOR AND OTHER USEFUL COMPONENTS

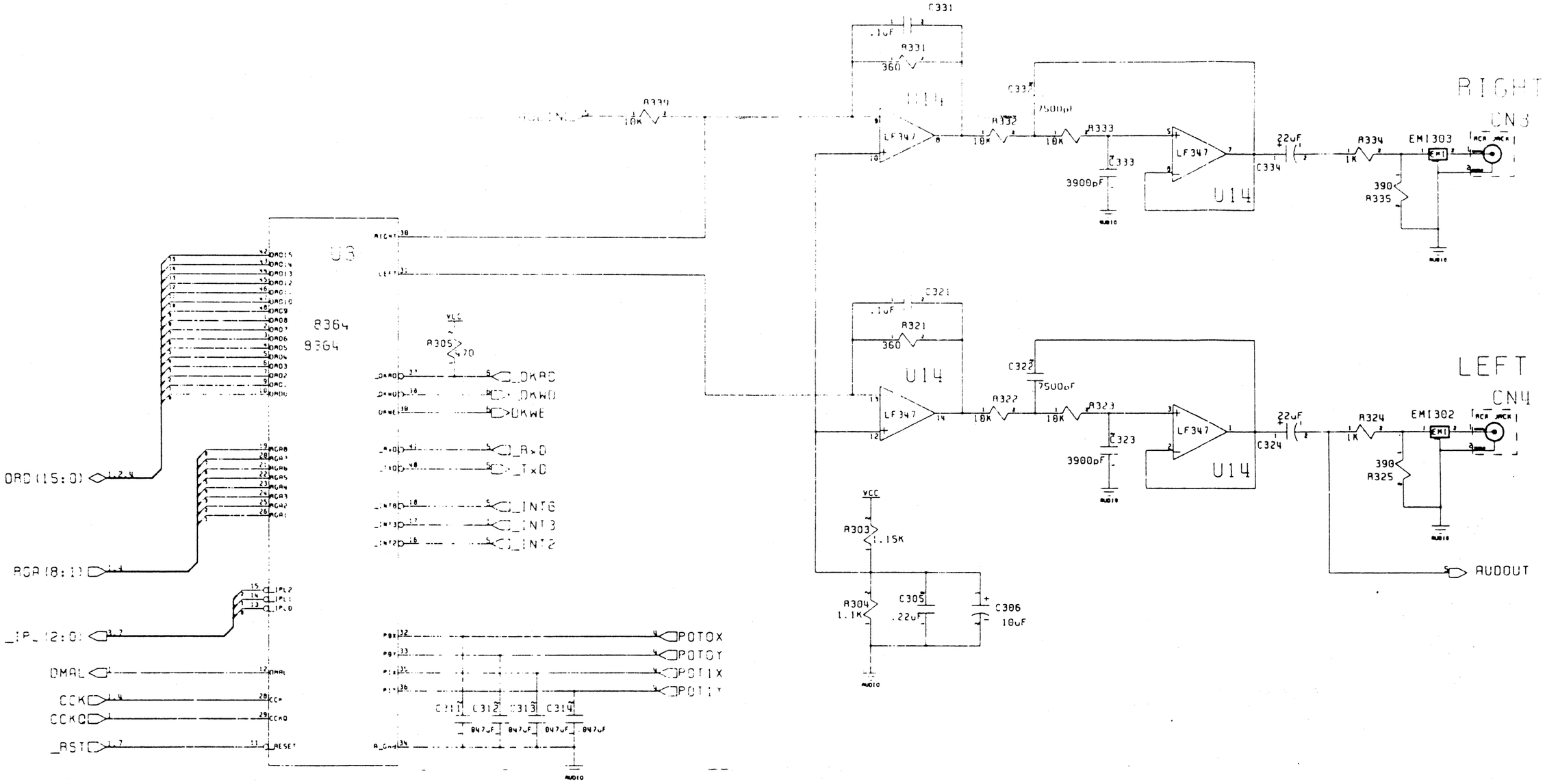
Commodore

C/A588 Main Board "Rock Lobster"

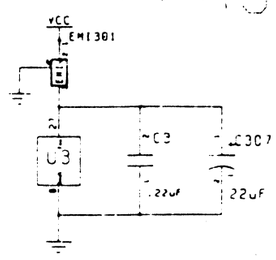
C 3125 11 2

SCALE NONE 2 OF 10

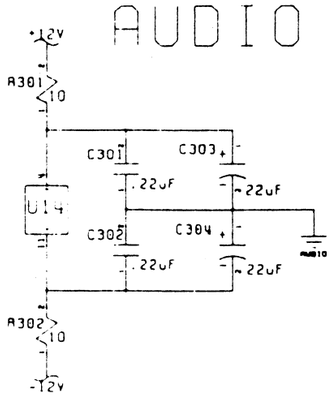
LEFT JOY
CN1
DB9P
RIGHT JOY
CN2
DB9P
4.7K×9
RP401
VCC
74HCT157
U15
_CCK
CCK
7MHz
U4
DENISE
8362
DAD(15:0)
RGA(8:1)
74HCT245
U40
74HCT245
U41
BURST
PIXELSW
_CSYNC
VIDEO
HYBRID
Y1
Vcc2
Vcc1
Gnd2
Gnd1
C402
47uF
CSYNC
CN9
VIDEO
DB23S
4.7K
R402
4.7K
R403
XCLK
_XCLKEN
RP402
RP403
47
CSYNC
_HSYNC
_VSYNC
HSYNC
VSYNC
-12V
+12V
COMPOSITE
CN10
RCA JACK
_FIRE0
POT0Y
POT0X
_FIRE1
POT1Y
POT1X
_CCK
C401
C40
C41
.047uF
47uF
U40
U41
3-39
DENISE IS PRETTY MUCH INTO VIDEO....
Commodore
8/8588 Main Board



PAULA POWER!



AUDIO POWER



PAULA DOES THINGS THAT DENISE DOESN'T

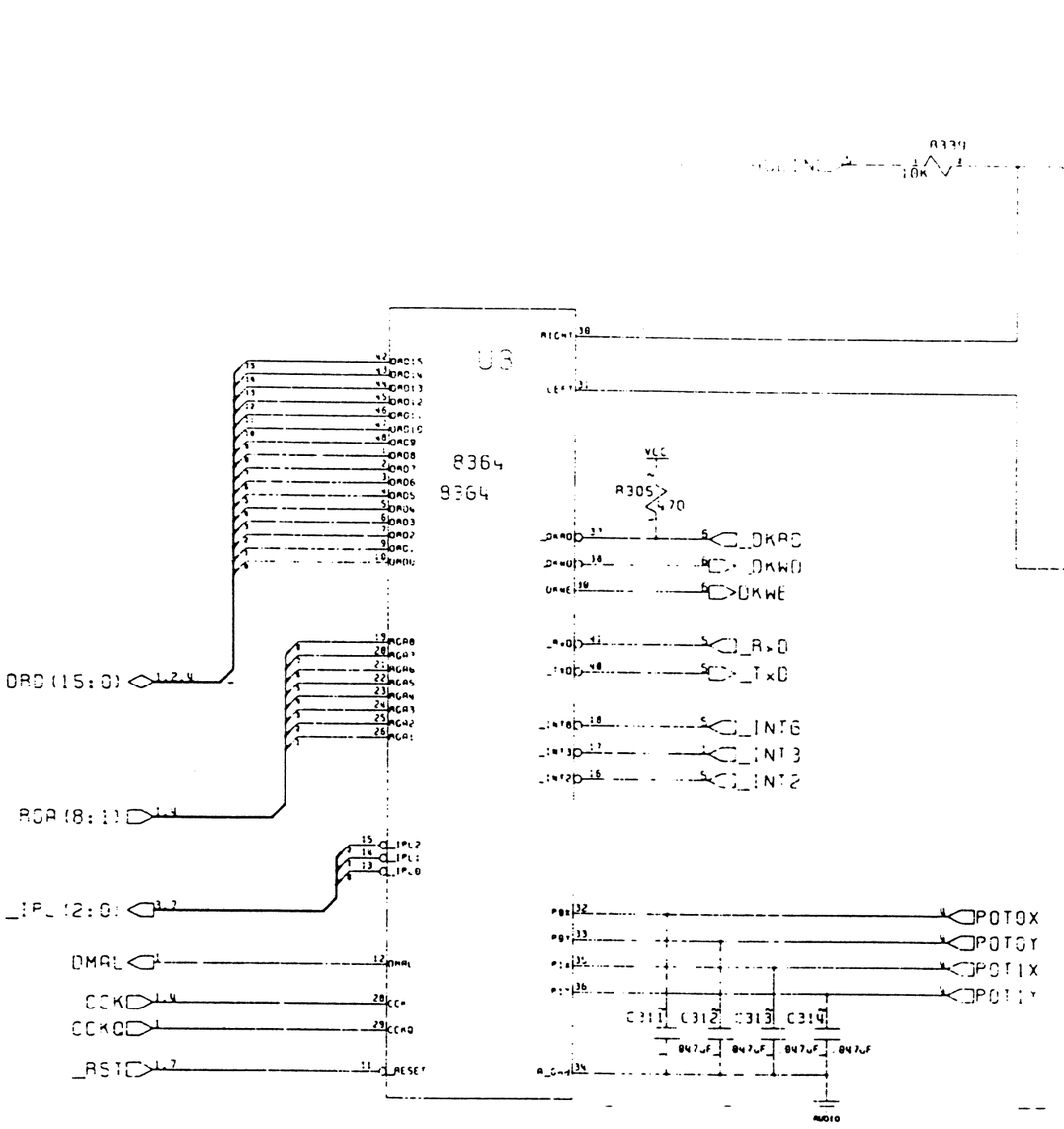
	DRAWN BY: L. Anderson	DATE: 11/29/88
	CHKD:	
	ENGR: SMD	11/29/88
	APPR:	
MATERIAL	PROD DEF	NEXT ASSY
	C/A500	313251

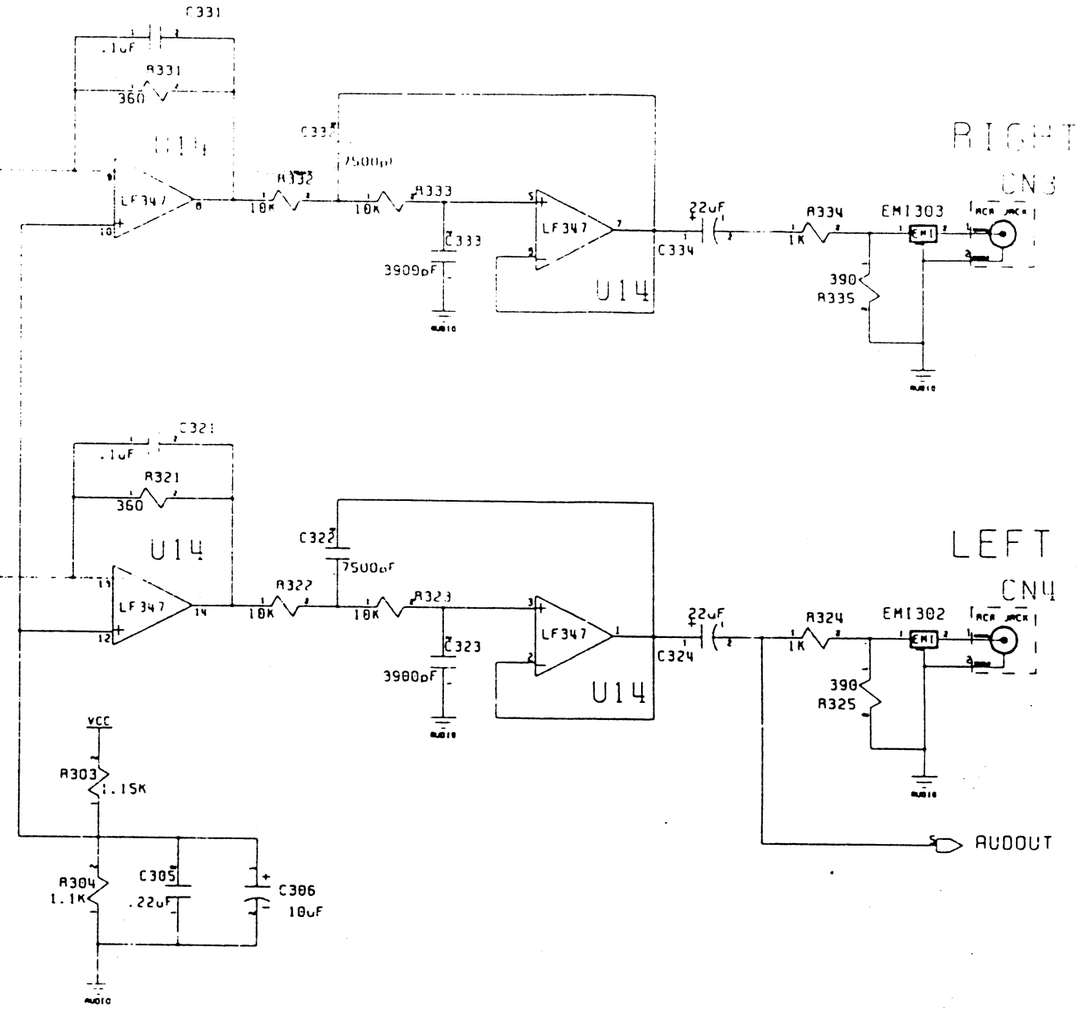
Commodore

C/A500 Main Board "Rock Lobster"

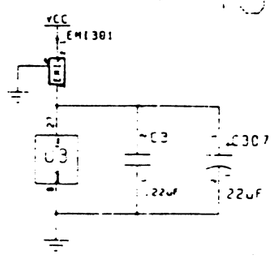
SIZE B | DWG 313251 | REV 2

SCALE | SHEET 4 OF 18

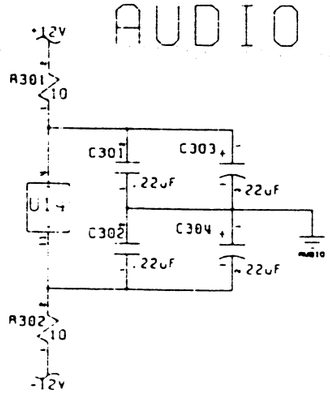




PAULA POWER!



AUDIO POWER



PAULA DOES THINGS THAT DENISE DOESN'T

		Commodore
		C/A500 Main Board "Rock Lobster"
		SIZE B 312511 REV 2
		SCALE SHEET 4 OF 18

LEFT JOY
CN1
DB9P
RIGHT JOY
CN2
DB9P
RP401
4.7Kx9
VCC
74HCT157
U15
_CCK
CCK
7MHz
DENISE
8362
U4
DRD(15:0)
RGA(8:1)
74HCT245
U40
74HCT245
VIDEO
HYBRID
Y1
_CSYNC
_FIRE0
POT0Y
POT0X
_FIRE1
POT1Y
POT1X
CN9
VIDEO
DB23S
XCLK
_XCLKEN
RP402
RP403
47
47 CSYNC
_HSYNC
_VSYNC
_CCK
-12V
+12V
C402
47uF
COMPOSITE
CN10
RCA JACK
C40
C41
U41
.047uF
EMI401
EMI402,2,6,7
EMI403
EMI404
EMI405
EMI406
EMI411
EMI412
EMI413
EMI414
EMI415
EMI416
EMI417
EMI421
EMI422
EMI423
EMI424
EMI425
EMI426
EMI427
EMI431
EMI432
EMI433
EMI434
EMI435

DENISE IS PRETTY MUCH INTO VIDEO
Commodore
C/A52E Main Board

KEYBOARD CONNECTOR

CENTRONICS

RS232 DECOUPLING

RS232

U7 8520

U8 8520

U38 1488

U39 1488

CN7

CN13

CN6 DB25P

OP25S

74LS32

4.7K×9

RP501

_KBCLOCK

_KBDATA

_KBRESET

_MTRON

_FIRE1

_FIRE0

_RDY

_TRK0

_WPROT

_CHNG

_LED

_OVL

_INDEX

_MTR

_SEL3

_SEL2

_SEL1

_SEL0

_SIDE

DIR

_STEP

D(15:0)

A(23:1)

_INT2

_VSYNC

_VMA

R_W

E

_INT6

_HSYNC

_RESET

_IORESET

PPD(7:0)

_TxD

_RxD

AUDIN

AUDOUT

Q501 2sc945

Q502 2n6673

D501 1N914

R501 10K

R502 10K

R503 4.7K

R504 4.7K

C501 .22uF

C502 .22uF

C39 .047uF

U39

U38

+12V

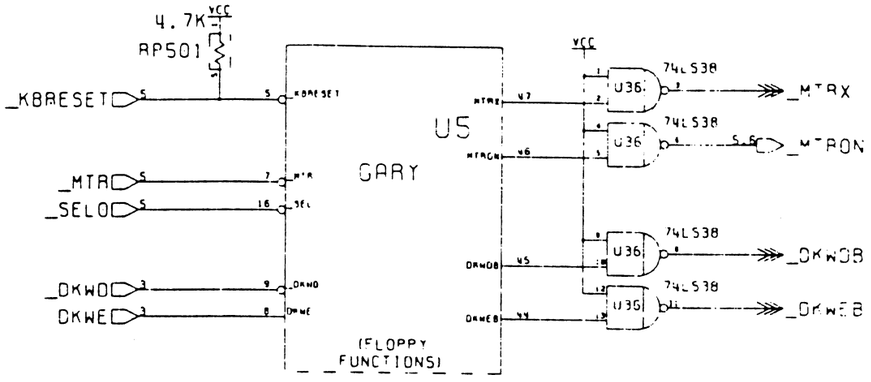
-12V

RS-232, CENTRONICS AND KEYBOARD

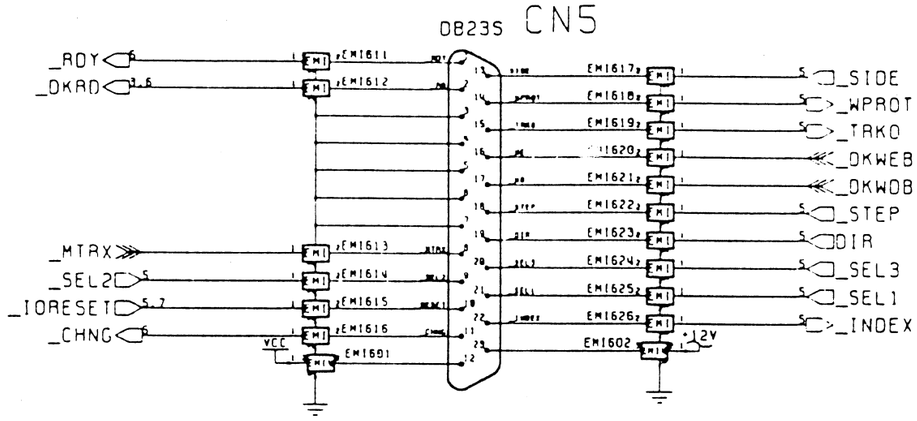
Commodore

C/128 Main Board

"Rock Lobster"

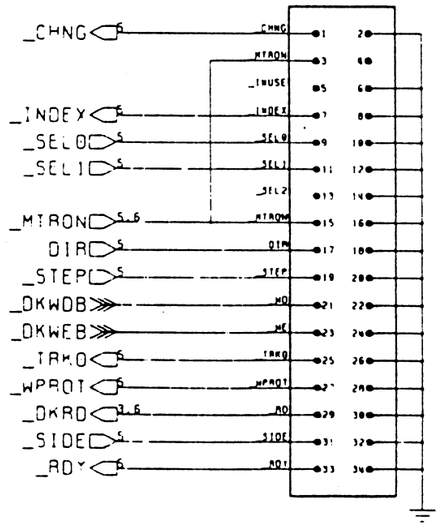


EXTERNAL FLOPPY



INTERNAL FLOPPY

CN11A/CN11B



FLOPPY DISK INTERFACE AND CONNECTORS

Commodore

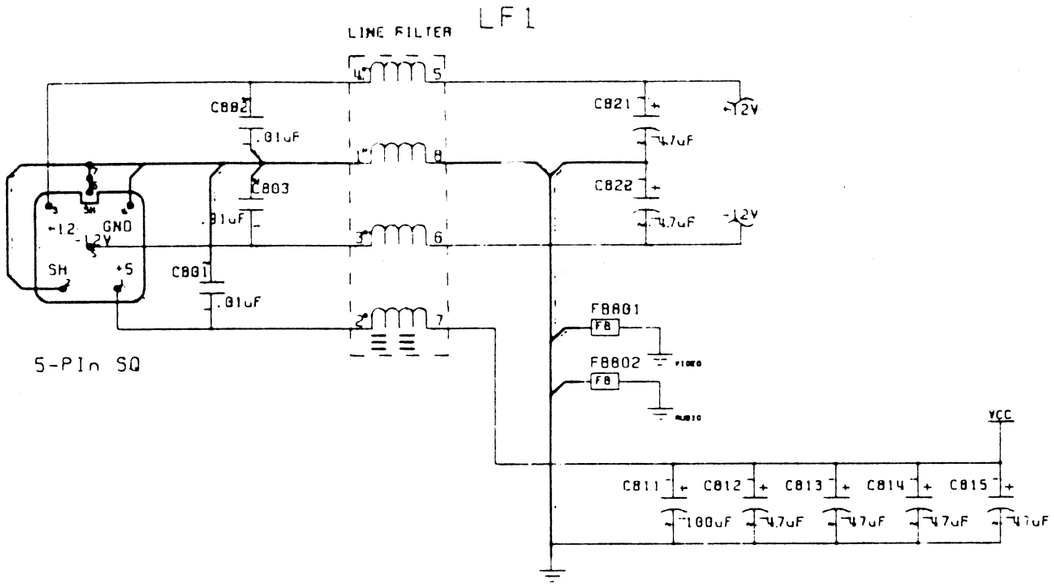
C/A580 Io Bn Board "Rock Lobster"

SIZE C | 31251 | REV 1

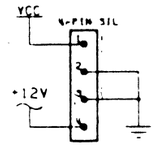
SCALE | SHEET 7 OF 10

POWER INPUT

CN8

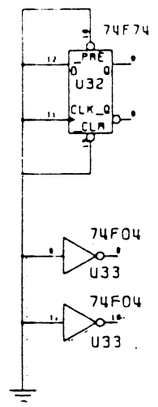


FLOPPY POWER



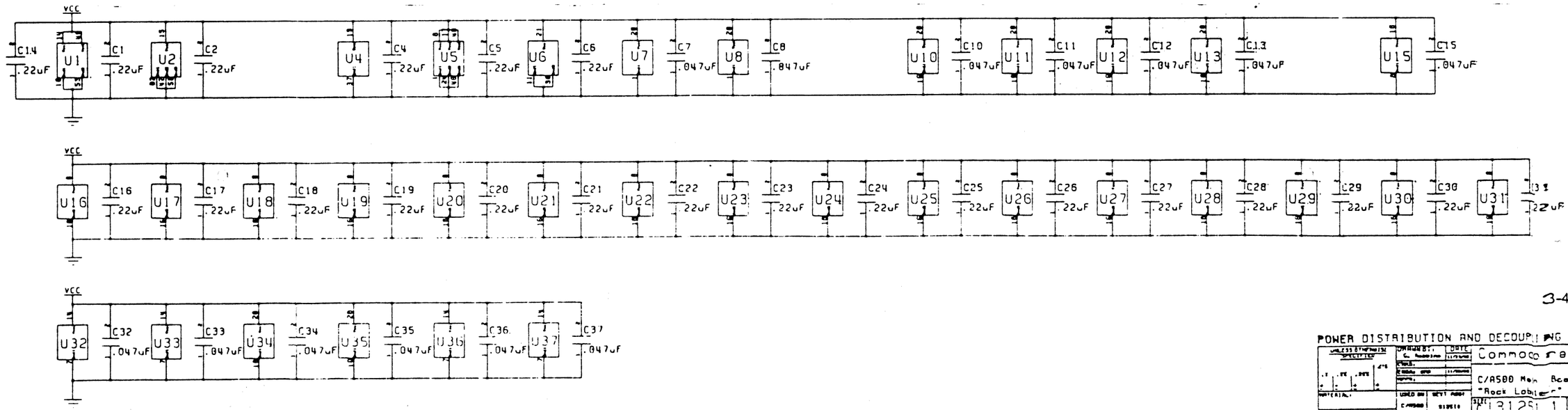
CN12

SPARES



NOTE: HEAVY LINES INDICATE A
SINGLE POINT CONNECTION

DECOUPLING



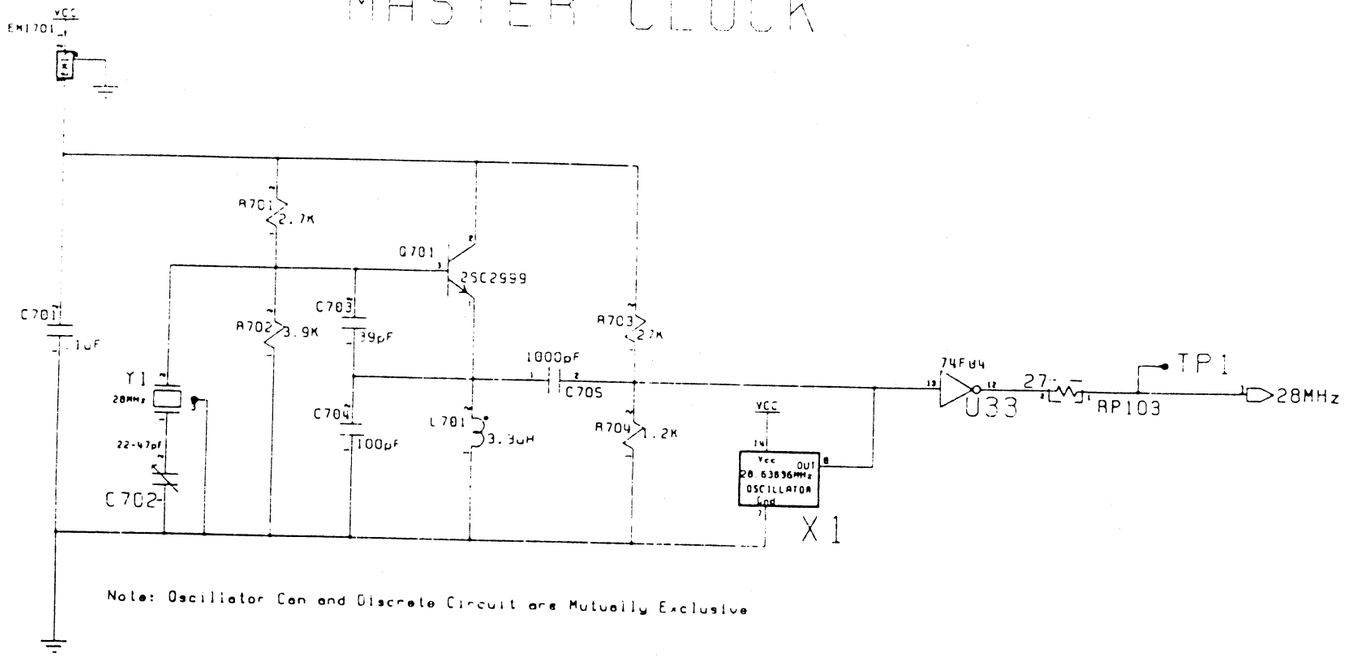
POWER DISTRIBUTION AND DECOUPLING

Commodore

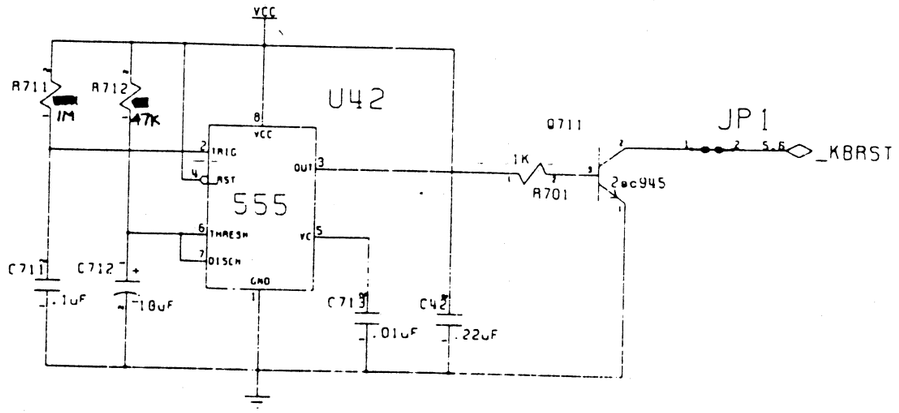
C/A500 Main Board "Rock Lobster"

C 31251 1 2

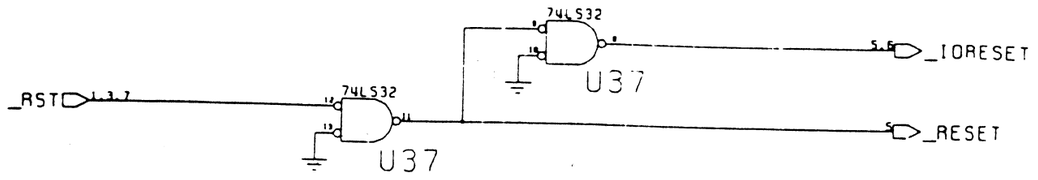
MASTER CLOCK



Note: Oscillator Can and Discrete Circuit are Mutually Exclusive

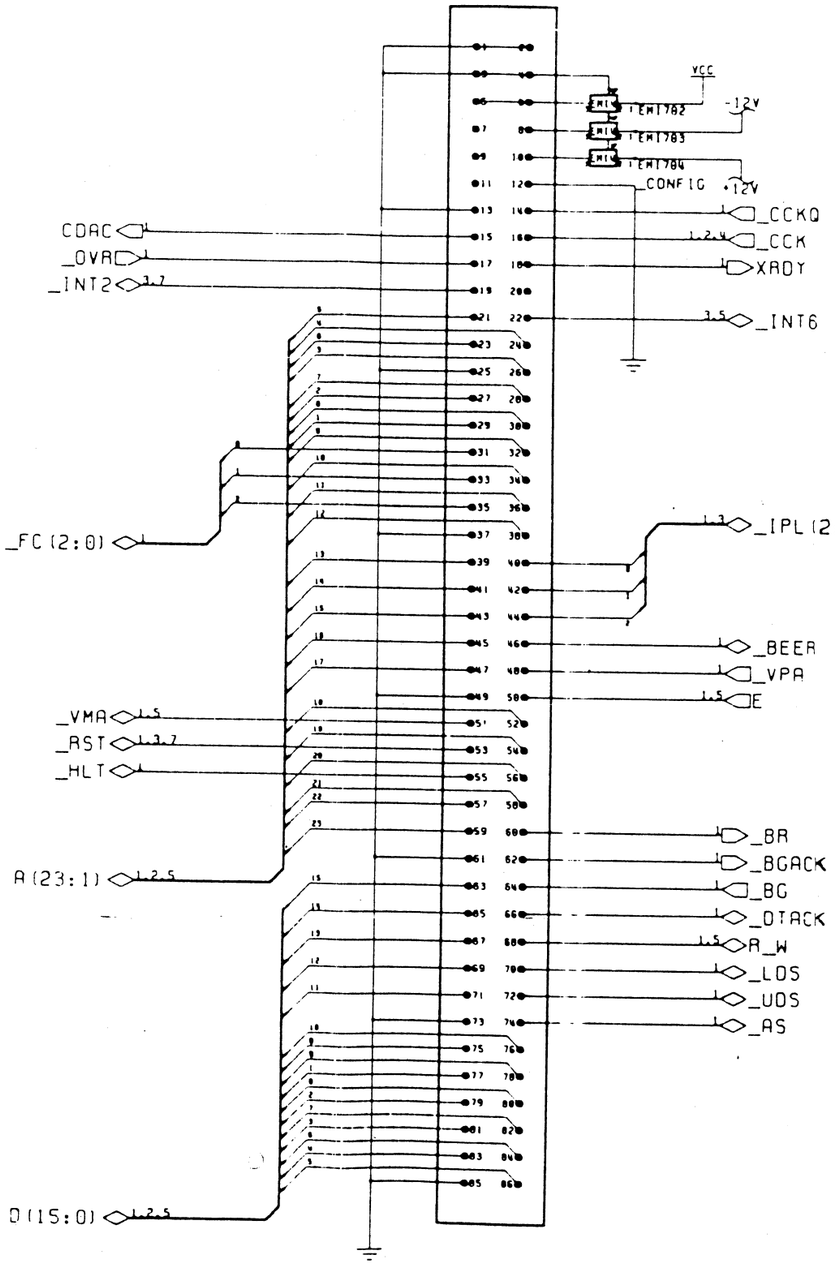


RESET ACTION



EXPANSION

P1A/P1B



EXPANSION CONNECTOR AND MASTER CLOCK

Commodore

C/RSBB M, In Board "Rock Lobster"

C 312511 2

SCALE NONE SHEET 8 OF 10

CNY/CNY1

+5X

XDAD(15:0)

RP901 1 2 27
RP901 3 4 27
RP901 5 6 27
RP901 7 8 27
RP901 9 10 27
RP902 1 2 27
RP902 3 4 27
RP902 5 6 27
RP902 7 8 27

RP903 1 2 27
RP903 3 4 27
RP903 5 6 27
RP903 7 8 27

XD(15:0)

XA(23:1)

_XCLKRAS

_XCLKWR

+12X

XX256-15 U48 U49 U50 U51 U52 U53 U54 U55

XX256-15 U56 U57 U58 U59 U60 U61 U62 U63

A0 A1 A2 A3 A4 A5 A6 A7 A8

_WE _CAS _RAS D1 D0

U9
MSM6242
STD.P
VCC
GND
CS1
CS2
WR
RD
ALE
D0 D1 D2 D3

R911 478
R912 10K TP3
D911 D912 1N914 1N914

BT1
3.6VDC Ni-Cd 1.5V 110mAH

C913 4.7uF
C914 .1uF

Y2 32768Hz
C911 20pF
C912 22-47pF

C901 .01uF
C902 47uF
C903 47uF

C48 C49 C50 C51 C52 C53 C54 C55 .22uF

C56 C57 C58 C59 C60 C61 C62 C63 .22uF

MEMORY EXPANSION AND REAL TIME CLOCK

Commodore

C/A581 Expansion "Clock Logic Board"

C 3125 11 2

REV	DESCRIPTION	DATE	APPVD	MANAGER
1	Engineering Prototype	02/13/86	GBB	
2	Advanced Engineering Release	11/23/86	GBB	
3	Pilot Production Release (FTZ)	03/04/87	GBB	
4	Pilot Production Release (FCC)	V010	GBB	
5	Pilot Production Release	05/04/87	GBB	5/7/87

Jumpers and Test Points

JP1 - System Reset vs. Keyboard Reset
JP2 - Memory Expansion Address Select
JP3 - Internal Memory Address Select

TP1 - 64 Hz Real-Time Clock Test Point

SIGNAL	DESCRIPTION
28MHZ	28.63636 MHz Master Clock
7MHZ	7 MHz Processor Clock
A[23:1]	Processor Address (68000)
ACK	Data Acknowledge (Parallel)
AS	Address Strobe (68000)
AUDIN	Audio Input (RS232 jack)
AUDOUT	Audio Output (RS232 jack)
BEER	Bus Error (68000)
BG	Bus Grant (68000)
BGACK	Bus Grant Acknowledge (68000)
BLISS	Blitter Slowdown (chips)
BLIT	Chip Memory Access (chips)
BR	Bus Request (68000)
BUSY	Device Busy (parallel)
CASL/CASU	CAS lower/upper byte (DRAM)
CCK	Color Clock aka C1 (chips)
CCKQ	Color Clock Quadrature aka C3 (chips)
CDAC	7 MHz Quatrature Clock
CHNG	Media Change (floppy)
CLKRD/CLKWR	Real-time Clock Read/Write
COMP	Composite Monochrome Video (video)
CSYNC	Composite Sync (video)
CTS	Clear to Send (rs232)
D[15:0]	Processor Data (68000)
DIR	Direction (floppy)
DKRD	Diskette Read Data (floppy)
DKWDB	Diskette Write Data (floppy)
DKWEB	Diskette Write Enable (floppy)
DMAL	Chip DMA Request (chips)
DRA[8:0]	DRAM Address (DRAM, chips)
DRD[15:0]	DRAM Data (DRAM, chips)
DSR	Data Set Ready (rs232)
DTACK	Data Transfer Acknowledge (68000)
DTR	Data Terminal Ready (rs232)
E	Peripheral E Clock (68000)
EXRAM	Expansion Memory Present
FC[0:0]	Function Control (68000)
FIRE0/FIRE1	Fire Button (joysticks)
HLT	Processor Halt (68000)
HSYNC	Horizontal Sync (video)
INDEX	Diskette Index Hole (floppy)
INT[2,3,6]	Interrput Requests (chips)
IORESET	I/O Reset
IPL[2:0]	Processor Interrupt Requests (68000)
KBCLOCK	Keyboard Clock (keyboard)
KBDATA	Keyboard Data (keyboard)
KBRESET	Keyboard Reset (keyboard)
LDS/UDS	Upper/Lower Data Strobe (68000)
LED	Power On LED

SIGNAL	DESCRIPTION
LEFT/RIGHT	Audio Channels
MTR	Motor On (floppy)
MTR0	Motor On Drive 0 (floppy)
M0V/M0H	Mouse Quadrature Signals (joysticks)
M1V/M1H	Mouse Quadrature Signals (joysticks)
OVL	Overlay ROM over RAM
OVR	Override System Decodeing
PIXELSW	Pixel Switch (video)
POT0X/POT0Y	Pot Lines (joysticks)
POT1X/POT1Y	Pot Lines (joysticks)
POUT	Paper Out (parallel)
PPD[7:0]	Parallel Port Data (parallel)
RAMEN	RAM Enable (chips)
REGEN	Chip Register Enable (chips)
RAS0/RAS1	RAS Internal/Expansion Lines (DRAM)
RDY	Drive Ready (floppy)
RESET	General Reset
RGA[8:1]	Register Address Bus (chips)
RI	Ring Indicate (rs232)
ROMEN	ROM Enable
RTS	Request to Send (rs232)
RST	Processor Reset (68000)
RXD	Receive Data (RS232)
RW	Processor Read/Write (68000)
SEL	Select (parallel)
SEL[3:0]	Drive Select (floppy)
SIDE	Side Select (floppy)
STEP	Head Step Command (floppy)
TRK0	Track 0 Sense (floppy)
TXD	Transmit Data (RS232)
VMA	Valid Memory Address (68000)
VPA	Valid Peripheral Address (68000)
VSYNC	Vertic1 Sync (video)
WE	Write Enable (DRAM)
WPROT	Write Protect Sense (floppy)
XCLK	External 28 MHz Clock (genlock)
XCLKEN	External Clock Enable (genlock)
XRDY	External Data Ready

ATTEMPT TO FORCE NODE NUMBERS VIA SEQUENCE

VCC +12V -12V +VID AUDIO EXP +5V -12V

A PAGE FOR SHARON AND VONNIE TO USE

DRAWN BY: G. Robbins	DATE: 01/15/87	Commodore	
CHKD:			
ENGR: GBB	DATE: 01/15/87		
APPR:		C/A500 Main Board "Rock Lobster"	
USED ON: C/A500	NEXT ASSY: 313518	SIZE: B	313511	REV: 5
		SCALE:	SHEET 1 OF 9	

Note: R103-104,106-108 are from EMI control
and may not be loaded in all cases

JP2 controls where expansion ram maps to:
A23 -> C00000 (normally), A19 -> 080000

4.7Kx9 RP102
470x7 RP104
U1 68000-8
U12 74LS244
U13 74LS373
U10 74LS244
U11 74LS373
R103 120
4.7Kx9 RP101
R102
R101
U5 SARA (CONTROL FUNCTIONS)
470x7 RP104
4.7Kx9 RP101
JP2
U2 8370 /8371 FAT AGNUS
74F04 U33
22 RP103
R107 R108 R106 120
X1 28.63636MHz OSCILLATOR
C701 .22uF
FB FB101
(PAL: 28.37516 MHz)
74F04 U33 22 RP103
R104 120

Rock Lobster
05/04/86

PROCESSOR AND OTHER USEFUL COMPONENTS

DRAWN BY: G. Robbins	DATE: 04/04/87	Commodore	
CHKD:			
ENGR: CAM	05/05/87	C/A500 Main Board "Rock Lobster"	
APPR:			
USED ON: C/A500	NEXT ASST: 312510	SIZE C	312511 REV 1.0
		SCALE	SHEET 2 OF 4

CNX

VCC

DRD(15:0) 2,4,5

DRA(8:0) 2

74F244 U34

74F244 U35

_EXRAM 2

_CASL 2

_CASU 2

_RASU 2

_RASL 2

_WE 2

_CCK 2,5,7

_CLKRD 2

_CLKWR 2

RP202₄ 368

RP202₈ 768

RP202₆ 568

RP201₄ 368

RP201₆ 568

RP201₂ 168

RP202₂ 168

RP201₈ 768

RP201₁₀ 968

RP203₇ 868

RP203₅ 668

RP203₃ 468

RP203₁ 268

JP3

+12V

-12V

U16 U17 U18 U19 U20 U21 U22 U23 U24 U25 U26 U27 U28 U29 U30 U31

XY256-15

U6

HN62402

128K x 16 ROM

_ROMEN 2

A(23:1) 2,6

D(15:0) 2,5

Note: JP3 swaps internal vs. expansion ram

ROM, RAM, RUM -- MORE ROM, RAM, RUM!

DRAWN BY: G. Maddine

Commodore

C/A500 Main Board "Rock Lobster"

USED ON: WEST A551

C/A500

312513

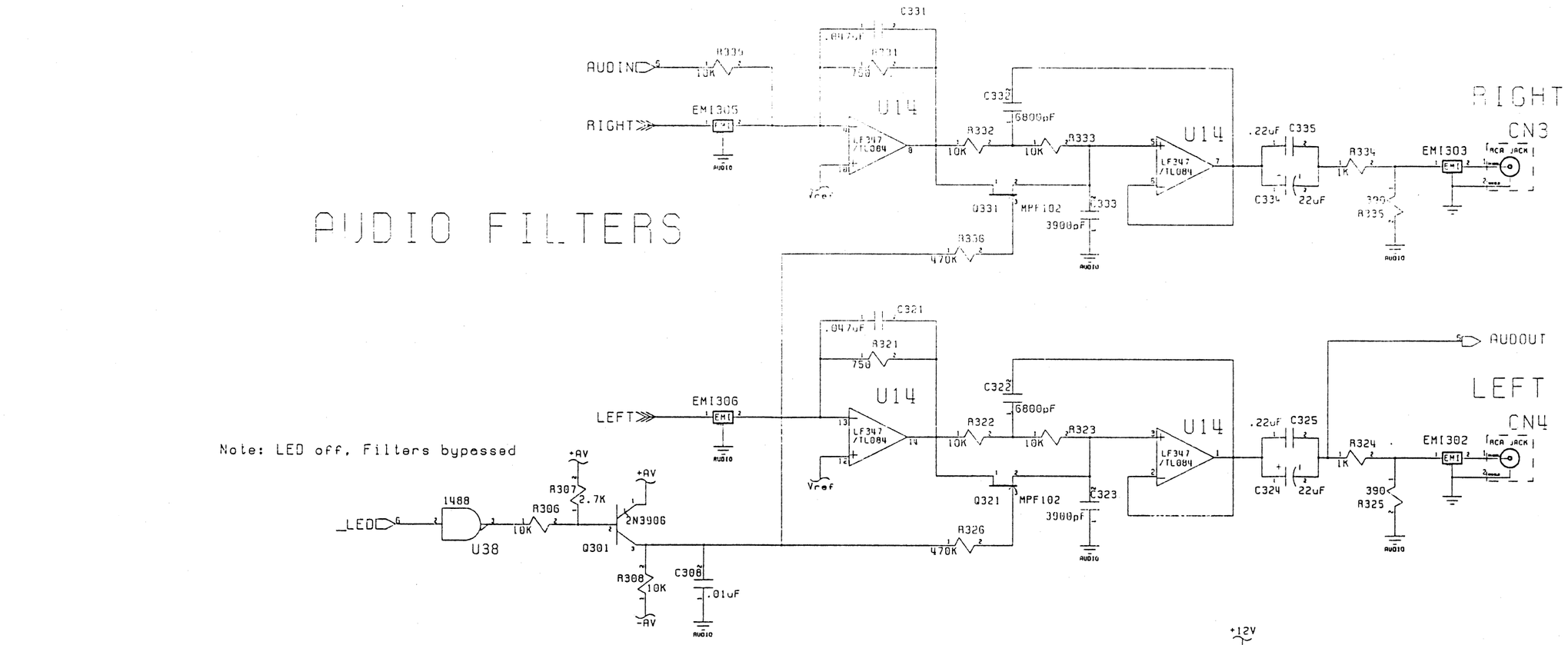
SIZE C

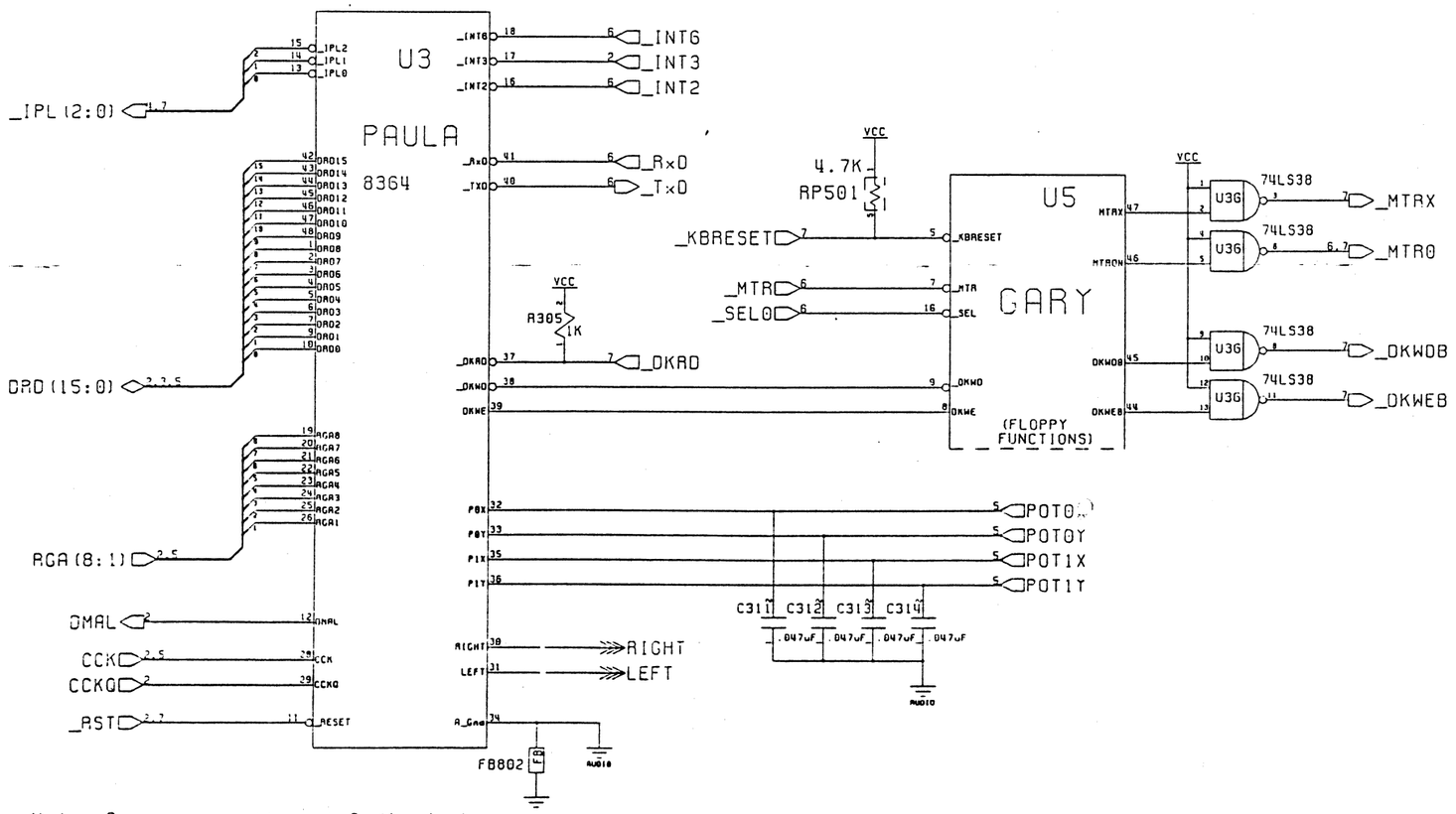
31251 1.5

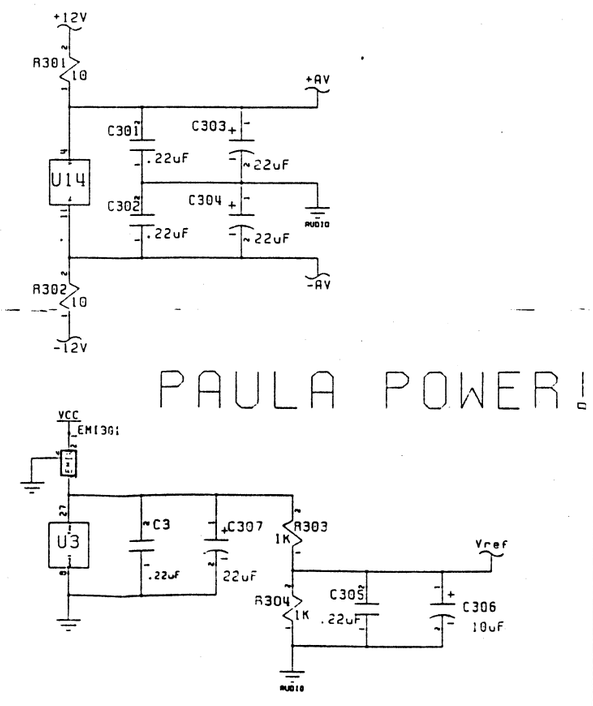
SCALE

SHEET 3 OF 9

AUDIO FILTERS







Note: Gound connection at Audio jacks

PAULA DOES THINGS THAT DENISE DOESN'T

DRAWN BY: G. Robbins	DATE: 09/06/87	Commodore	
CHKD:			
ENGR: CRR	09/09/87	C/A500 Main Board "Rock Lobster"	
APPR:			
USED ON: C/A500	NEXT ASSY: 312510	SIZE: C	312511 REV: 5
		SCALE	SHEET 4 OF 5

note: EMI401 is looped with 4.7 Ohm Resistor

LEFT JOY
CN1
DB9P

RIGHT JOY
CN2
DB9P

RP401 4.7K x 8

74LS157
U15

RP404 68

R404 120

RP405 120

U4
DENISE
8362

U40 74HCT245

U41 74HCT245

HY1
VIDEO
HYBRID

RP402 47

RP403 47

R402 4.7K

R403 4.7K

CN9
VIDEO
DB23S

CN10
RCA JACK

R409 150

COMPOSITE

R409 Controls Output Level

R406 4.7

R405 4.7

3300uF

.22uF C4

C401

.047uF C40

.047uF C41

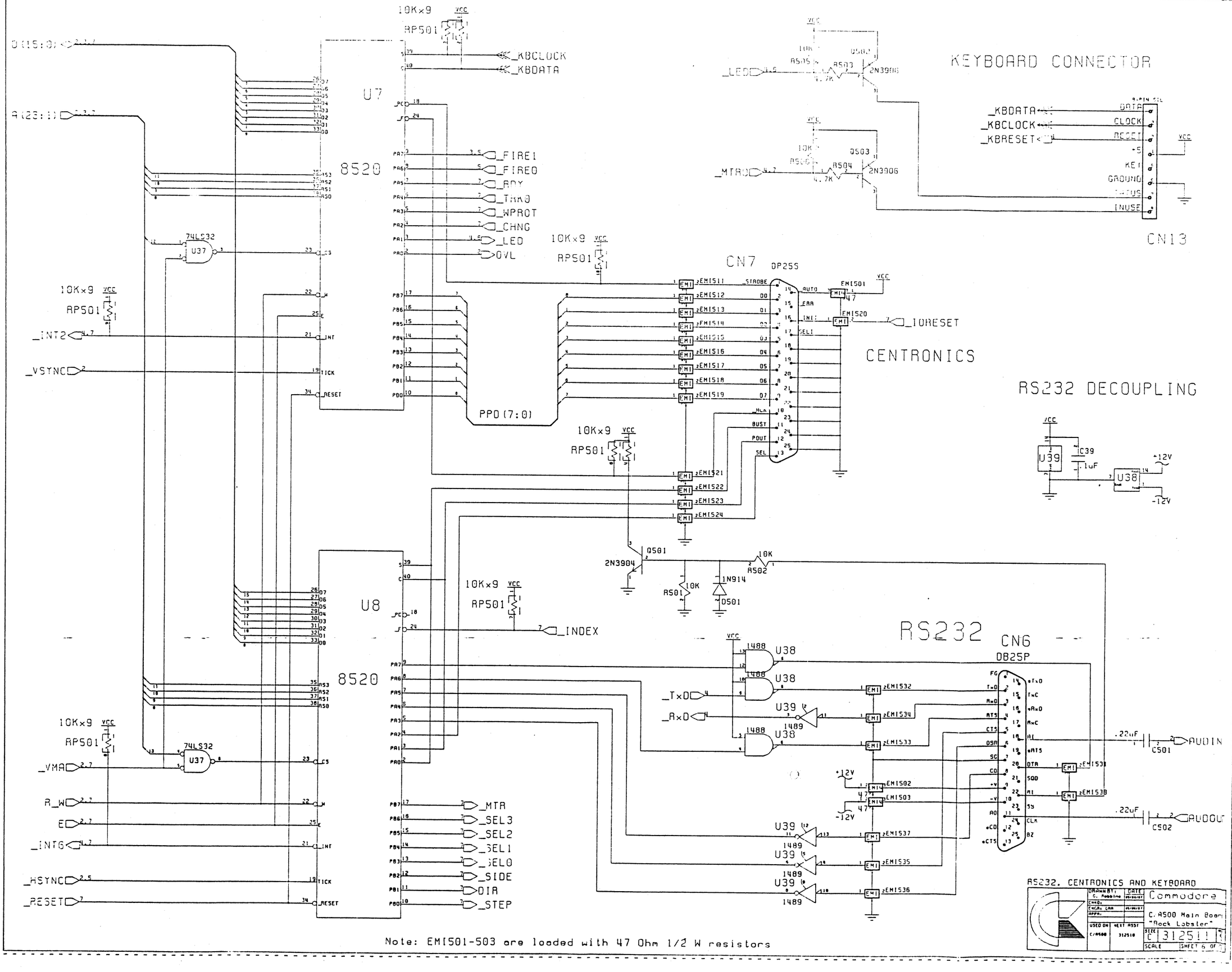
C402 3300uF

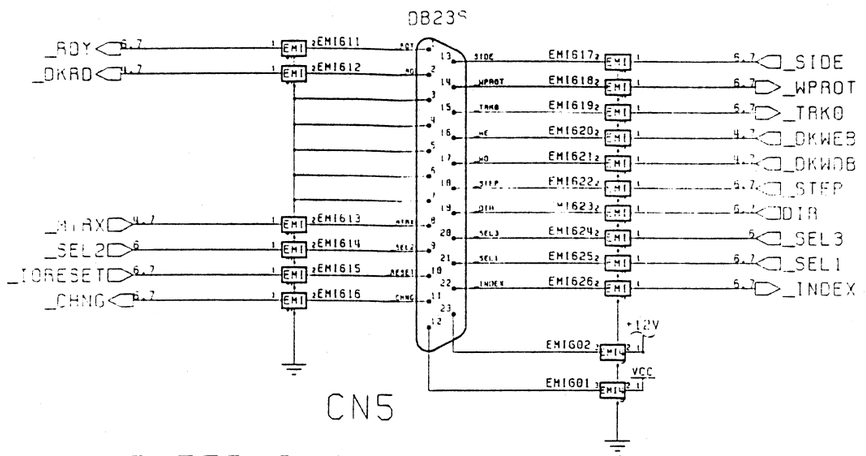
DENISE IS PRETTY MUCH INTO VIDEO...

Commodore

C/A500 Main Board
"Rock Lobster"

SIZE A 312511 REV


KEYBOARD CONNECTOR
CN13
_KBDATA
_KBCLOCK
_KBRESET
DATA
CLOCK
RESET
+5
KEY
GROUND
STATUS
INUSE
6-PIN DIL
_LED
_MTR
R505
R503
R504
R506
Q502
Q503
2N3906
10K
4.7K
VCC
U7
8520
U8
RP501
10Kx9
74LS32
U37
_KBCLOCK
_KBDATA
_FIRE1
_FIRE0
_RDY
_TRK0
_WPROT
_CHNG
_LED
_OVL
PPD(7:0)
CN7
DP25S
CENTRONICS
_STROBE
AUTO
ERR
INIT
SELI
_IORESET
BUSY
POUT
SEL
EMI501
EMI520
47
RS232 DECOUPLING
U39
C39
.1uF
U38
+12V
-12V
_INT2
_VSYNC
_INT
_TICK
_RESET
_INDEX
_VMA
R_W
E
_INTG
_HSYNC
_RESET
_SEL3
_SEL2
_SEL1
_SEL0
_SIDE
DIR
_STEP
Q501
2N3904
R502
R501
1N914
D501
RS232
CN6
DB25P
1488
1489
_TxD
_RxD
.22uF
C501
C502
AUDIN
AUDOUT
Note: EMI501-503 are loaded with 47 Ohm 1/2 W resistors
RS232, CENTRONICS AND KEYBOARD
Commodore
C.A500 Main Board
"Rock Lobster"
312511
DRAWN BY: C. Robbins
DATE 05/05/87
USED ON C/A500
NEXT ASSY 312510
SIZE C
SCALE
SHEET 5 OF

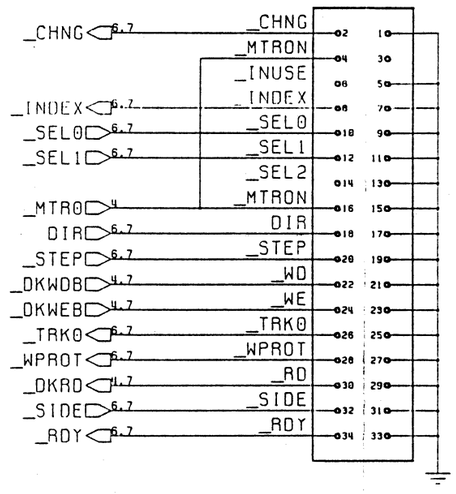


CN5

EXTERNAL FLOPPY

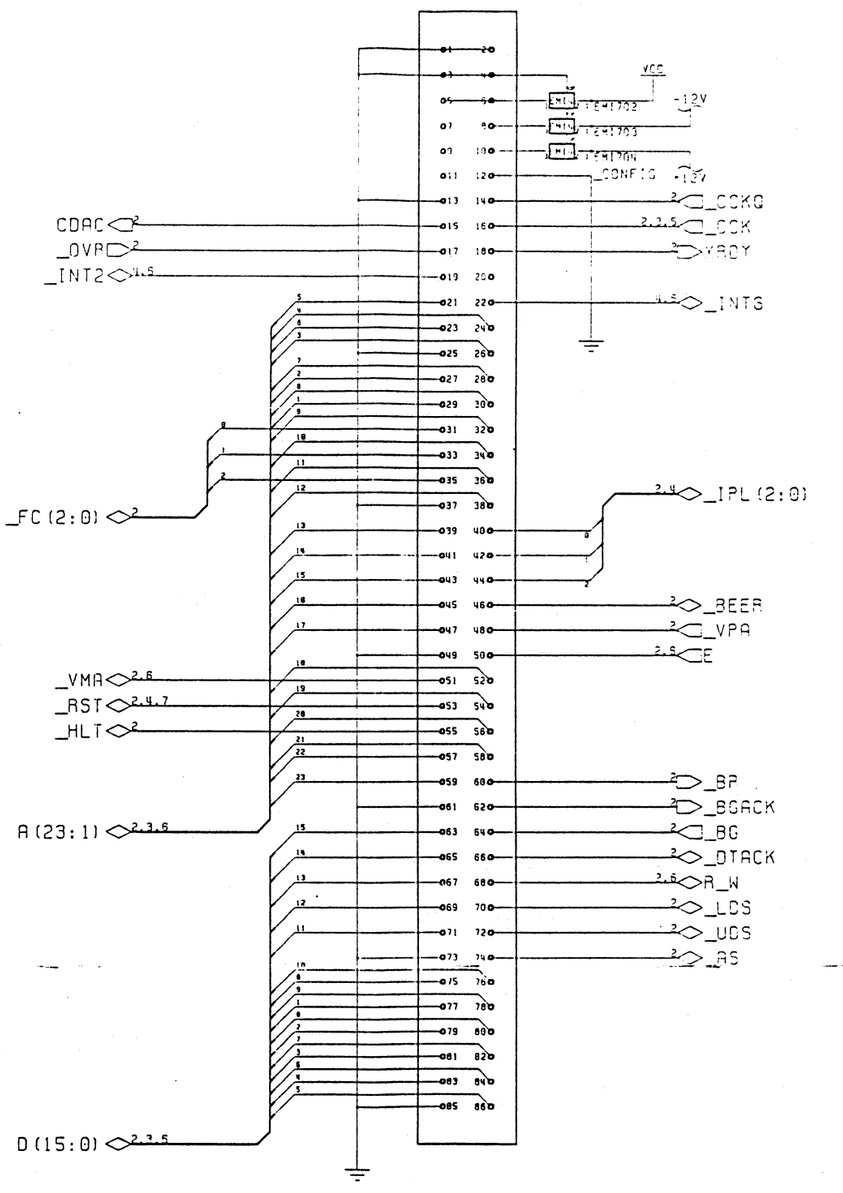
INTERNAL FLOPPY

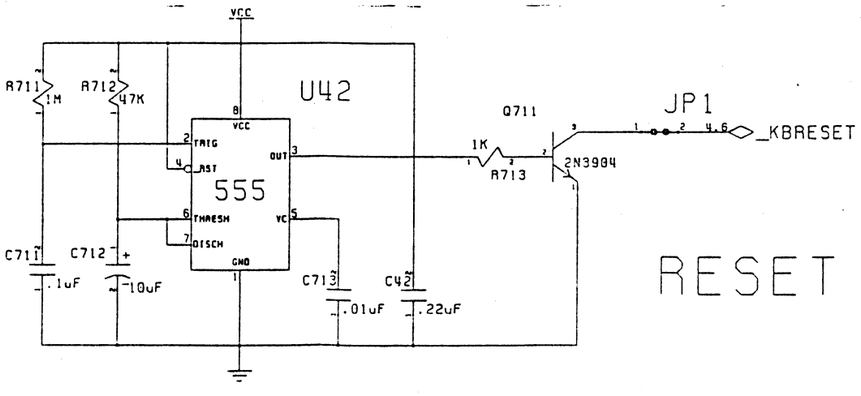
CN11



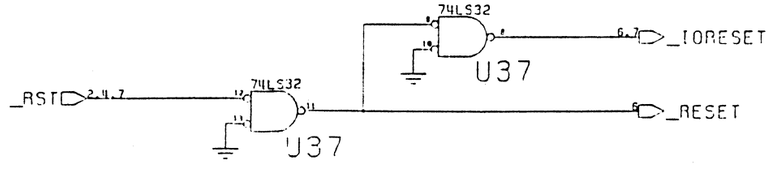
EXPANSION

P1





RESET ACTION



FLOPPY DISK AND EXPANSION CONNECTORS

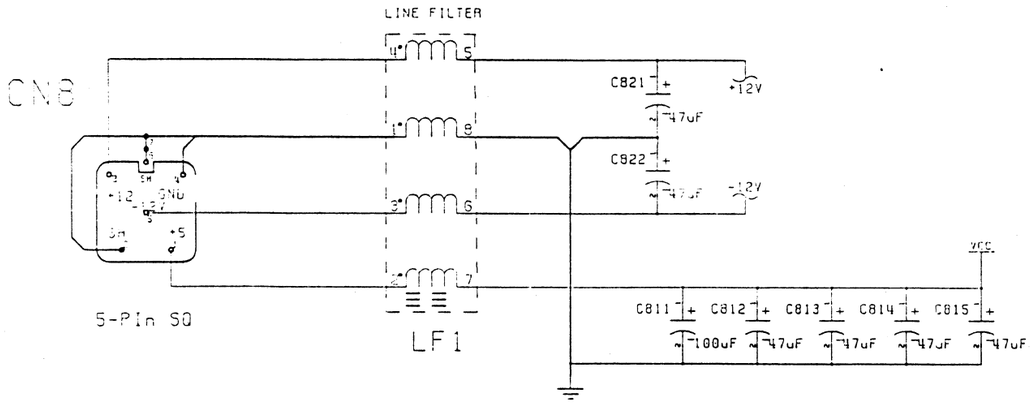
Commodore

C.A500 Main Board

"Rock Lobster"

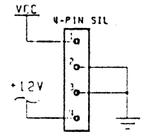
312511 15

POWER INPUT

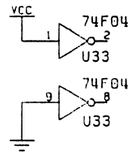


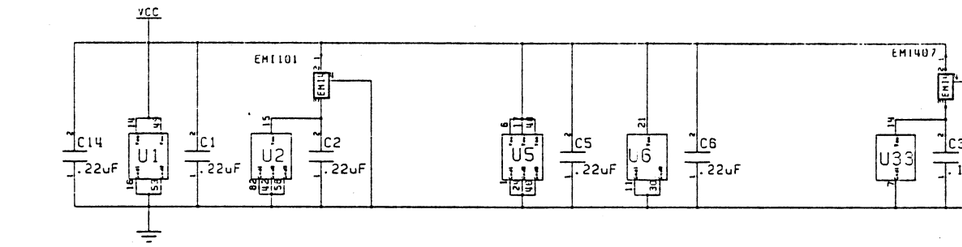
NOTE: HEAVY LINES INDICATE A
SINGLE POINT CONNECTION

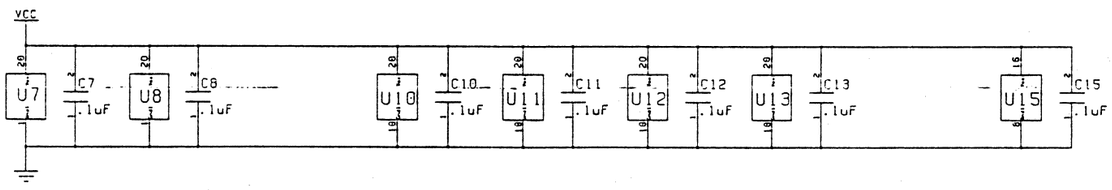
FLOPPY POWER

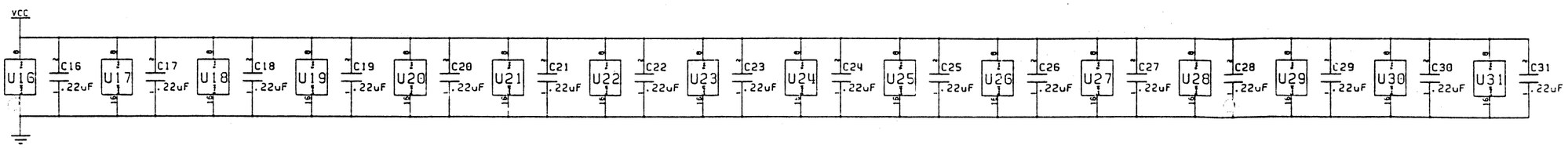


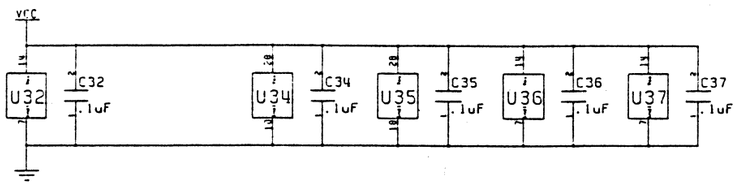
SPARES











DECOUPLING

POWER DISTRIBUTION AND DECOUPLING

DRAWN BY: C. Hawkins	DATE: 09/08/87	Commodore	
CHKD:			
ENGR: J.M.	09/08/87	C-A500 Main Board	
APPD:		"Rock Lobster"	
USED ON: C-A500	NEXT ASSY: 312510	SIZE: C	312511 REV: 5
		SCALE	SHEET 3 OF 5

CNY

+5X

XDRD(15:0)

RP901 1 2 68
RP901 3 4 68
RP901 5 6 68
RP901 7 8 68
RP901 9 10 68
RP902 1 2 68
RP902 3 4 68
RP902 5 6 68
RP902 7 8 68

RP903 1 2 68
RP903 3 4 68
RP903 5 6 68
RP903 7 8 68

XD(15:0)

XA(23:1)

_XCLKRD

_XCLKWR

+12X

XX256-15 U48 U49 U50 U51 U52 U53 U54 U55

XX256-15 U56 U57 U58 U59 U60 U61 U62 U63

A0 A1 A2 A3 A4 A5 A6 A7

_WE _CAS _RAS

D1 D0

+5X

U9
MSM6242B

D0 D1 D2 D3
STD.P
A0 A1 A2 A3
ALE
RD
WR
CS1
CSB
VCC
GND
XT

R912 10K TP3

R911 470 D911 1N914

D912 1N914

R913 470 BT1 3/600K Ni-Cd 4.5V 30mAH

C913 4.7uF

C914 .1uF

Y2 32768Hz

C911 20pF

C912 6.8-41pF

+5X

C902 47uF

C903 47uF

C48 C49 C50 C51 C52 C53 C54 C55 .22uF

C56 C57 C58 C59 C60 C61 C62 C63 .22uF

MEMORY EXPANSION AND REAL TIME CLOCK

DRAWN
CHKD
ENGR
APPR

DATE

COMMODORE

USED ON C/A500

NEXT ASSY 312510

C/A500 Main Board "Rock Lobster"

SIZE C 312511-16

SCALE

SHEET 3 OF 5

ERSATZTEILE

PART NO.	DESCRIPTION
312510-01	A500, PCB ASSEMBLY, NTSC
312510-02	A500, PCB ASSEMBLY, PAL

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
1		ADVANCE ENGINEERING RELEASE	11/7/86	
2		PILOT PRODUCTION RELEASE & ADDED SHEET #6 & MODIFIED PER ENGRS MARKER PRINT		

1. SHEET 6 OF 6 SIZE C
ASSEMBLY DWG.

NOTES:

commodore	TITLE: A500, PCB ASSEMBLY	DRAWN BY S.KOZACHYN	DATE 10/14/86	ENGR: APPR:	SIZE B	DRAWING NO 312510	SHEET 1 OF 6

QUANTITY REQD PER PART/DASH NO. 02	QUANTITY REQD PER PART/DASH NO. 01	ITEM	DS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
R	R	1		312511-01	PCB SCHEMATIC			
R	R	2		312512-01	PCB FABRICATION DRAWING			
1	1	3		312513-01	PCB ARTWORK			
		4						
1	1	5		390084-03	IC, MC68000, 8MHZ	U1		
0	1	6		318070-01	IC, FAT AGNUS 8370 NTSC	U2		
1	0	7		318071-01	IC, FAT AGNUS 8371 PAL	U2		
1	1	8		252127-01	IC, PAULA, 8364	U3		
1	1	9		252126-01	IC, DENSE, 8362	U4		
1	1	10		318072-01	IC, GARY	U5		
2	2	11		318029-02	IC, 8520R4	U7,U8		
1	1	12		315093-01	ROM, KICKSTART V1.2	U6		TO BE PROGRAMMED ONTO 315094
16	16	13		390026-01	IC, DRAM 256K X 1, 150 NS	U16-U31		MAY SUBSTITUTE 380223-01
1	1	14		901882-01	IC,1488	U38		
1	1	15		901883-01	IC, 1489	U39		
1	1	16		390086-01	IC, LF347/TL084	U14		
1	1	17		390110-01	IC, 74F04	U33		
1	1	18		901521-31	IC, 74LS32	U37		
1	1	19		901521-38	IC, 74LS38	U36		
1	1	20		390081-01	IC, 74F74	U32		
1	1	21		901521-11	IC, 74LS157	U15		
2	2	22		318050-01	IC, 74F244	U34,U35		
2	2	23		901521-13	IC, 74LS244	U10,U12		
2	2	24		310003-01	IC, 74HC245	U40,U41		
2	2	25		901521-29	IC, 74LS373	U11,U13		
1	1	26		901523-01	IC, NE555	U42		
1	1	27		252167-01	DIN, 5 PIN, SQUARE	CN8		POWER
2	2	28		327032-02	DB9P, D-SUB, 9 PIN, MALE	CN1,CN2		JOYSTICK
S	S	29		390242-02	DB9P, D-SUB, 9 PIN, MALE	CN1,CN2		SUBSTITUTE FOR ITEM 28
1	1	30		327032-03	DB23P, D-SUB, 23 PIN, MALE	CN9		VIDEO
S	S	31		390242-03	DB23P, D-SUB, 23 PIN, MALE	CN9		SUBSTITUE FOR ITEM 30
1	1	32		327033-03	DB23S, D-SUB, 23 PIN, FEMALE	CN5		DISK DRIVE
S	S	33		390241-03	DB23S, D-SUB, 23 PIN, FEMALE	CN5		SUSTITUTE FOR ITEM 32
1	1	34		327032-05	DB25P, D-SUB, 25 PIN, MALE	CN6		RS232
S	S	35		390242-05	DB25P, D-SUB, 25 PIN, MALE	CN6		SUBSTITUTE FOR ITEM 34
1	1	36		327033-05	DB25S, D-SUB, 25 PIN, FEMALE	CN7		CENTRONICS
S	S	37		390241-05	DB25S, D-SUB, 25 PIN, FEMALE	CN7		SUBSTITTE FOR ITEM 36

commodore

TITLE: A500, PCB ASSEMBLY

DRAWN BY: S.KOZACHYN DATE 10/14/88

CHKD:

ENGR: DATE

APPR:

SIZE B | 312510 | REV 2 | SHT 5 of 6

QUANTITY REQD PER PART/DASH NO. 02	QUANTITY REQD PER PART/DASH NO. 01	ITEM	DS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
1	1	38		252122-01	RCA JACK, WHITE	CN3		SEE ITEM 73
1	1	39		252122-02	RCA JACK, RED	CN4		
1	1	40		252122-03	RCA JACK, YELLOW	CN10		
1	1	41		903326-04	HEADER, 4-PIN SIL	CN12		
1	1	42		903326-08	HEADER, 8-PIN SIL	CN13		
1	1	43		903345-17	HEADER, 34 PIN DIL	CN11		
1	1	44		390243-01	HEADER, DUAL, RA, LONG, 56 POS., MALE	CNX		
1	1	45		390227-05	RESISTOR NTWK. 68 OHM PARALLEL x 5, 10 PIN	RP203		
4	4	46		902410-08	RESISTOR NTWK, 4.7K PULLUP X 9, 10 PIN	RP101,RP102		
		~~47~~				RP401,RP501		
1	1	48		902442-17	RESISTOR NTWK, 470 PULLUP X 7, 8 PIN	RP104		
2	2	49		390227-03	RESISTOR NTWK, 22 OHM PARALLEL X 5, 10 PIN	RP103,		
2	2	50		902422-06	RESISTOR NTWK, 68 OHM PAR x 4, 8 PIN	RP201, 202		
2	2	51		902422-05	RESISTOR NTWK, 47 PARALLEL X 4, 8 PIN	RP402,403		
2	2	52		901550-64	10 OHM +/- 5% 1/4 WATT	R301,R302		
2	2	53		901550-90	27 OHM +/- 5% 1/4 WATT	R101,R102		
2	-	54		901550-57	390 OHM +/- 5% 1/4 WATT	R325,R335		
1	1	55		901550-58	470 OHM +/- 5% 1/4 WATT	R305		
2	2	56		901550-108	360 OHM +/-5% 1/4 WATT	R331,R321		
5	5	57		901550-01	1K OHM +/-5% 1/4 WATT	R303,R304		
		~~58~~			R713	R324,R334		
1	1	59		901550-17	1.2K OHM +/-5% 1/4 WATT	R704		
1	1	60		901550-23	2.7K OHM +/-5% 1/4 WATT	,R701		
1	1	61		901550-39	3.9K OHM +/-5% 1/4 WATT	R702		
4	4	62		901550-19	4.7K OHM +/-5% 1/4 WATT	R402,R403		
		~~63~~				R503,R504		
9	9	64		901550-20	10K OHM +/-5% 1/4 WATT	R322,R323		
		~~65~~				R332,R333		
		~~66~~				R339,R501		
		~~67~~			R505	R502,R506		
1	1	68		901550-15	27K OHM +/-5% 1/4 WATT	R703		
1	1	69		901550-22	47K OHM +/-5% 1/4 WATT	R712		
2	2	70		252133-01	FERRITE BEAD	FB801,802		
1	1	71		901550-84	1M OHM +/-5% 1/4 WATT	R711		
		72						
S	S	73		390248-01	RCA JACK	CN3,CN4,CN10		SUBSTITUTE FOR ITEMS 38, 39 & 40
		74						

commodore	TITLE: A500, PCB ASSEMBLY	DRAWN BY: S.KOZACHYN	DATE 10/15/86	ENGR:	DATE	SIZE B	312510	REV 2	SHT 3/6
		CHKD:		APPR:					

QUANTITY REQD PER PART/DASH NO 02	QUANTITY REQD PER PART/DASH NO 01	ITEM	DS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
		75						
72	72	76		251842-02	EMI FILTER 100PF	EMI301-303		
		77				EMI401-405		
		78				EMI411-417		
		79				EMI421-427		
		80				EMI431-435		
		81				406		
		82				EMI511-524		
		83				EMI531-538		
		84				EMI601,602		
		85				EMI611-626		
		86				EMI701-704		
		87						
3	3	88		901550-56	RESISTOR 47 OHM +/- 5% 1/4 WATT	EMI501-503		
		89						
		90						
1	1	91		900462-27	CAPACITOR, 39PF, M.C. AXIAL, NPO	C703		
1	1	92		900462-37	CAPACITOR, 100PF, MLC, AXIAL, NPO	C704		
		93						
1	1	94		900463-16	CAPACITOR, 1000PF, MLC, AXIAL, X7R	C705		
2	2	95		900463-23	CAPACITOR, 3900PF, AXIAL, X7R	C323,C333		
2	2	96		900463-26	CAPACITOR, 6800PF, AXIAL, X7R	C322,C332		
		97						
4	4	98		390082-02	CAPACITOR, .01UF, MLC, AXIAL, Z5U	C410,C412		
		99				C801,C713		
4	4	100		900463-36	CAPACITOR, .047UF, MLC, AXIAL, X7R	C311-C314		
17	17	101		390082-01	CAPACITOR, .1UF, MLC, AXIAL, Z5U	C7,C8,C10		
		102				C11-C13		
		103				C15,C33		
		104				C34-C37		
		105				C39,C321		
		106				C331,C701		
		107				C711		
		108						
		109						
		110						
		111						

commodore

TITLE: A500, PCB ASSEMBLY

DRAWN BY: S.KOZACHYN | DATE: 10/14/86 | CHKD: | ENGR: | APPR: | DATE | SIZE: B | 312510 | REV: 2 | SHT 4 of 6

QUANTITY REQD PER PART/DASH NO 02	01	ITEM	DS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
32	32	112		390082-05	CAPACITOR, .22UF, MLC AXIAL Z5U	C1-C6		
		~~113~~				C16-C32		
		~~114~~				C14,C40,C41		
		~~115~~				C301,C302		
		~~116~~				C305,C501		
		~~117~~				C502,C42		
2	2	118		390101-06	CAPACITOR, 10UF, ELECTROLYTIC, RADIAL	C306,C712		
		119						
5	5	120		390101-04	CAPACITOR, 22UF, ELECTROLYTIC, RADIAL	C303,C304		
		~~121~~				C307,C324		
		~~122~~				C334		
8	8	123		390101-01	CAPACITOR, 47UF, ELECTROLYTIC, RADIAL	C401,C402		
		~~124~~				C812-C815		
		~~125~~				C821,C822		
		~~126~~						
1	1	127		390101-02	CAPACITOR, 100UF	C811		
1	1	128		251029-06	VARIABLE CAPACITOR, 6.8-45PF	C702		
1	1	129		390239-01	TRANSISTOR, 2N5770 NPN O.C.	Q701		
2	2	130		902658-01	TRANSISTOR, 2N3904, NPN G.P.	Q501,Q711		
2	2	131		902707-01	TRANSISTOR, 2N3906, PNP G.P.	Q502,Q503		
1	1	132		900850-01	DIODE, 1N4148	D501		
		133						
		134						
		135						
1	1	136		390229-01	VIDEO HYBRID	HY1		
	1	137		251878-02	LINE FILTER, 8 PIN	LF1		
1	1	138		901151-19	3.3 UH CHOKE	L701		
0	1	139		900556-11	CRYSTAL, 28.63636 MHZ	Y1		NTSC
		140						
1	0	141		900556-12	CRYSTAL, 28.37516 MHZ	Y1		PAL
		142						
		143						
3	3	144		904150-06	SOCKET, 40 PIN DIP	U6,U7,U8		
3	3	145		251313-01	SOCKET, 48 PIN DIP	U3,U4,U5		
1	1	146		390185-01	SOCKET, 84 PIN PLCC	U2		
1	1	147		904150-10	SOCKET, 64 PIN DIP	U1		
5	5	148		251313-02	SOCKET, 48 PIN DIP	U3,U4,U5		SUBSTITUTE FOR ITEM 145

commodore	TITLE: A500, PCB ASSEMBLY	DRAWN BY: S. KOZACHYNI	DATE: 10/22/88	ENGR:	DATE	SIZE: B	312510	REV: 2	SHT: 6
		CHK'D:		APPR:					

PART NO.	DESCRIPTION
312604-01	A501 RAM/CLOCK EXP., PCB ASS'Y

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
1		ADVANCED ENGINEERING RELEASE	12-1-86	GSPotter
2		PILOT PRODUCTION RELEASE		

1. SHEET 1 OF 3 SIZE C
   ASSEMBLY DWG.

NOTES:

commodore	TITLE: A501 RAM/CLOCK EXP., PCB ASS'Y	DRAWN BY: S.KOZACHYN	DATE 11/13/86	ENGR:		SIZE B	DRAWING NO 312604
		CHKD:		APPR:			SHEET 1 OF 3

QUANTITY REQD PER PART/DASH NO. 01	ITEM	DS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
	1						
R	2		312517-01	PCB SCHEMATIC			
R	3		312517-01	PCB FABRICATION DRAWING			
R	4		312517-01	PCB ARTWORK			
	5						
	6						
	7						
16	8		390026-01	IC, DRAM, 256K X 1, 150 NS	U48-U63		
1	9		318073-01	IC, REALTIME CLOCK, OKI MSM6242B	U9		
	10						
1	11		380393-01	BATTERY, NICAD, 3.6V, 60 MAH	BT1		
1	12		900560-01	CRYSTAL, 32.768 KHZ	Y2		
1	13		380311-05	HEADER, FEMALE, DUAL, RA, 56 POS.	CNY		
	14						
	15						
16	16		390082-05	CAP, AXIAL, MLC, Z5U, .22UF	C48-C63		
1	17		390082-01	CAP, AXIAL, MLC, Z5U, .1UF	C914		
1	18		390082-02	CAP, AXIAL, MLC, Z5U, .01UF	C901		
1	19		900462-21	CAP, AXIAL, MLC, NPO, 22PF	C911		
	20						
2	21		390101-01	CAP, RADIAL, ELECTROLYTIC, 47UF	C902,903		
1	22		390101-05	CAP, RADIAL, ELECTROLYTIC, 4.7UF	C913		
1	23		251029-06	CAP, VARIABLE, 6.8-45PF	C912		
	24						
	25						
2	26		900850-01	DIODE, IN4148	D911-D912		
2	27		902422-06	RESISTOR NTWK, 68 OHM PARALLEL X 4, 8 PIN	RP902-903		
1	28		390227-05	RESISTOR NTWK, 68 OHM PARALLEL X 5, 10PIN	RP901		
2	29		901550-58	RESISTOR, 470 OHM, 5%, 1/4 WATT	R911, R913		
1	30		901550-20	RESISTOR, 10K OHM, 5%, 1/4 WATT	R912		
	31						
	32						
	33						
	34						
	35						
	36						
	37						

commodore	TITLE: A501 RAM/CLOCK EXP., PCB ASS'Y.	DRAWN BY: E MOZACHYN	DATE 11-13-86	ENGR:	DATE	SIZE B	312604	REV 2	SHT 2 / 3
		CHKD:		APPR:					

PART NO.	DESCRIPTION
312587-01	MAIN ASSEMBLY - U.S./CANADA
-02	GERMANY/AUSTRIA
-03	FRANCE/BELGIUM
-04	ITALY
-05	SWEDEN/FINLAND
-06	SPAIN/SO. AMERICA
-07	DENMARK
-08	SWITZERLAND
-09	NORWAY
-10	NETHERLANDS
-11	ICELAND
312587-12	MAIN ASSEMBLY - U.K.

REVISIONS

LTR	ZONE	DESCRIPTION	DATE	APPROVED
1		ADVANCE ENGINEERING REL		
2		PILOT PRODUCTION RELEASE		

1. SHEET 3 OF 3 SIZE D
ASSY DWG
NOTES:

commodore

TITLE MAIN ASSY.
AMIGA-A500

DRAWN BY T. COLEY
CHKD
DATE 11-17-86
ENGR APPR
SIZE B
DRAWING NUMBER 312587
SHEET 1 OF 3

QUANTITY REQD PER PART / DASH NO.												ITEM	DS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
12	11	10	09	08	07	06	05	04	03	02	01							
1	1	1	1	1	1	1	1	1	1	1	1	1	C	312591-01	RAM EXP. DOOR			
												2						
1	1	1	1	1	1	1	1	1	1	1	1	3	B	312592-01	RATING LABEL & SERIAL NO.			
												4						
4	4	4	4	4	4	4	4	4	4	4	4	5	B	950150-03	RUBBER FEET			
												6						
1	1	1	1	1	1	1	1	1	1	1	1	7	D	312505-01	TOP CASE			
												8						
1	1	1	1	1	1	1	1	1	1	1	1	9	B	380133-03	PLATE, LOGO			
												10						
1	1	1	1	1	1	1	1	1	1	1	1	11	C	312595-01	COVER, EXPANSION			
												12						
											1	13	D	312514-01	BOTTOM CASE ASS'Y. - U.S./CANADA			
										1		14	↓	-02	- GERM./AUST.			
									1			15	↓	-03	- FRAN./BELG.			
								1				16	↓	-04	- ITALY			
							1					17	↓	-05	- SWED./FINL.			
						1						18	↓	-06	- SPAIN/S.A.			
					1							19	↓	-07	- DENMARK			
				1								20	↓	-08	- SWITZERLAND			
			1									21	↓	-09	- NORWAY			
		1										22	↓	-10	- NETHERLANDS			
	1											23	↓	-11	- ICELAND			
1												24	D	312514-12	BOTTOM CASE ASS'Y. - U.K.			
												25						
												26						
												27						
6	6	6	6	6	6	6	6	6	6	6	6	28		390146-01	SCREW, TORQUE #5 X 5/16 LG. STEEL			
												29						
												30						
												31						
												32						
												33						
												34						
												35						
												36						
												37						

commodore	TITLE: MAIN ASS'Y. AMIGA-A500	DRWN BY: T. COLEY	DATE 11-18-86	ENGR: M MESTELLER	DATE 11-5-86	SIZE B	312557	REV 2	SHT 3/5
		CHKD:		APPR:					

ADVANCED REPRO

QUANTITY REQD PER PART / DASH NO.												ITEM	DS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
12	11	10	09	08	07	06	05	04	03	02	01							
1	1	1	1	1	1	1	1	1	1	1	1	1	D	312506-01	BOTTOM CASE			
												2						
1	1	1	1	1	1	1	1	1	1	1	1	3	D	312504-01	TOP SHIELD			
												4						
1	1	1	1	1	1	1	1	1	1	1	1	5	D	312589-01	INSULATION SHEET			
												6						
1	1	1	1	1	1	1	1	1	1	1	1	7	D	312590-01	BOTTOM SHIELD			
												8						
1	1	1	1	1	1	1	1	1	1	1	1	9		312594-01	DISK DRIVE ASSEMBLY - CHINON			
5	5	5	5	5	5	5	5	5	5	5	5	10		312594-02	DISK DRIVE ASSEMBLY - PANASONIC			SUBSTITUTE FOR LINE 9
											1	11		312510-01	PCB ASSEMBLY - NTSC			
												12						
1	1	1	1	1	1	1	1	1	1	1		13		312510-02	PCB ASSEMBLY - PAL			
												14						
1	1	1	1	1	1	1	1	1	1	1	1	15	D	327038-01	RF SHIELD EXPANSION			
												16						
											1	17	D	312502-01	KEYBOARD ASS'Y - US/CANADA			
										1		18		-02	- GERM./AUST.			
									1			19		-03	- FRAN./BELG.			
								1				20		-04	- ITALY			
							1					21		-05	- SWED/FINL.			
						1						22		-06	- SPAIN/S.A.			
					1							23		-07	- DENMARK			
				1								24		-08	- SWITZERLAND			
			1									25		-09	- NORWAY			
		1										26		-10	- NETHERLANDS			
	1											27		-11	- ICELAND			
1												28	D	312502-12	KEYBOARD ASS'Y - U.K.			
												29						
												30						
												31						
4	4	4	4	4	4	4	4	4	4	4	4	32		390146-01	SCREW, TORQUE #5 X 5/16 LG - STEEL			
												33						
3	3	3	3	3	3	3	3	3	3	3	3	34		906800-05	SCREW, METRIC M3 X 6 - STEEL			
												35						
												36						
												37						

commodore

TITLE: BOTTOM CASE ASSEMBLY AMIGA - A500

DRWN BY: T. CALEY DATE: 1-17-86

CHKD:

ENGR: DATE: 1-17-86

APPR:

SIZE: B 312504 REV: 3 SHT: 2/3

ADVANCED REPRO

Drive
JU 363-282 3.5“

DRIVE PHYSICAL SPECIFICATIONS

GENERAL

The section contains the mechanical dimensions and mounting recommendations for the JU-3X3.

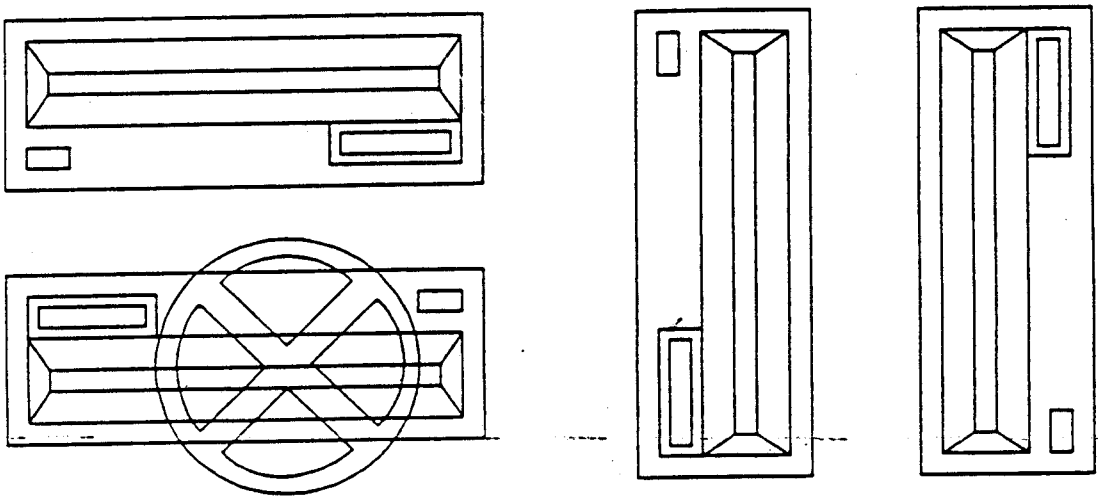
MOUNTING

NOTE

DO NOT MOUNT HORIZONTALLY WITH PCB UP
DO NOT MOUNT VERTICALLY WITH FRONT BEZEL UP/DOWN

The drive is capable of being mounted in either of the following positions

Front Loading
- mounted vertically with door opening left or right.
- mounted horizontally with PCB down.



HORIZONTAL VERTICAL

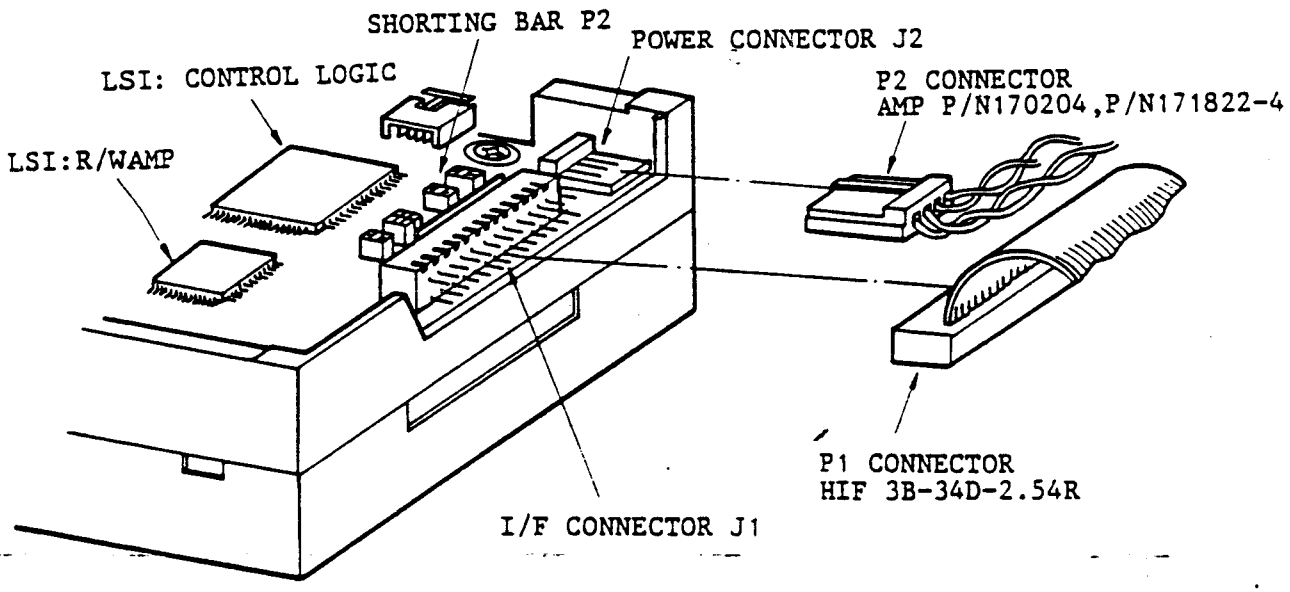
RECOMMENDED MOUNTING POSITIONS

PHYSICAL INTERFACE

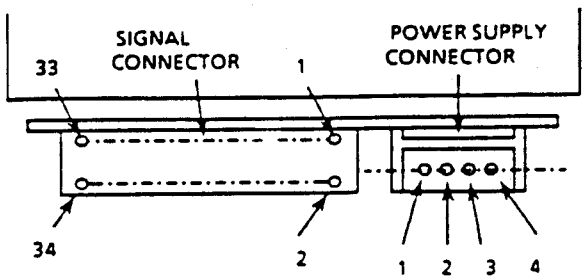
INTRODUCTION

The electrical interface between the JU-3X3 and the host system is via two connectors. The first connector, J1, provides the signal interface and the second connector, J2, provides the dc power.

This section describes the physical connectors used on the drive and the recommended connectors to be used with them.



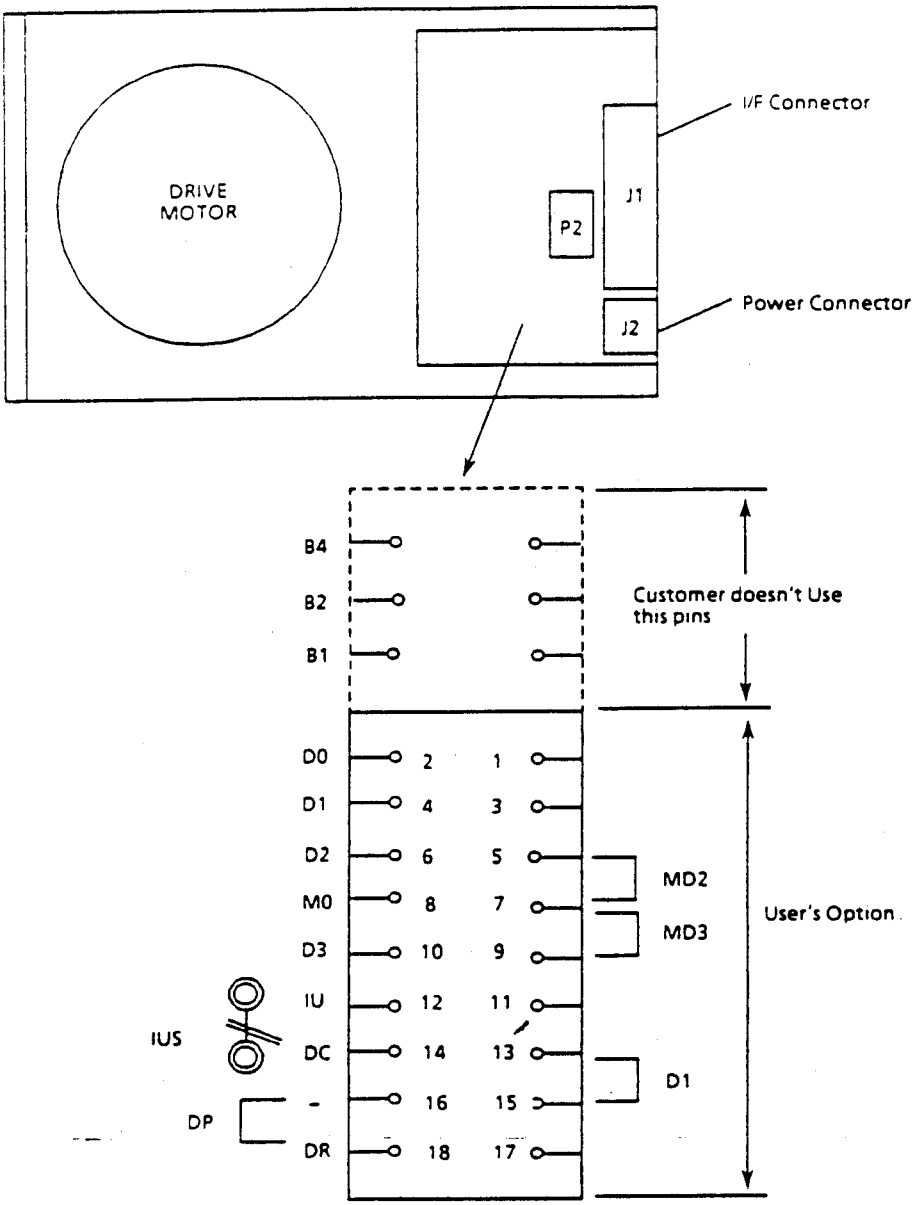
INTERFACE CONNECTORS LOCATIONS



J1/J2 CONNECTOR

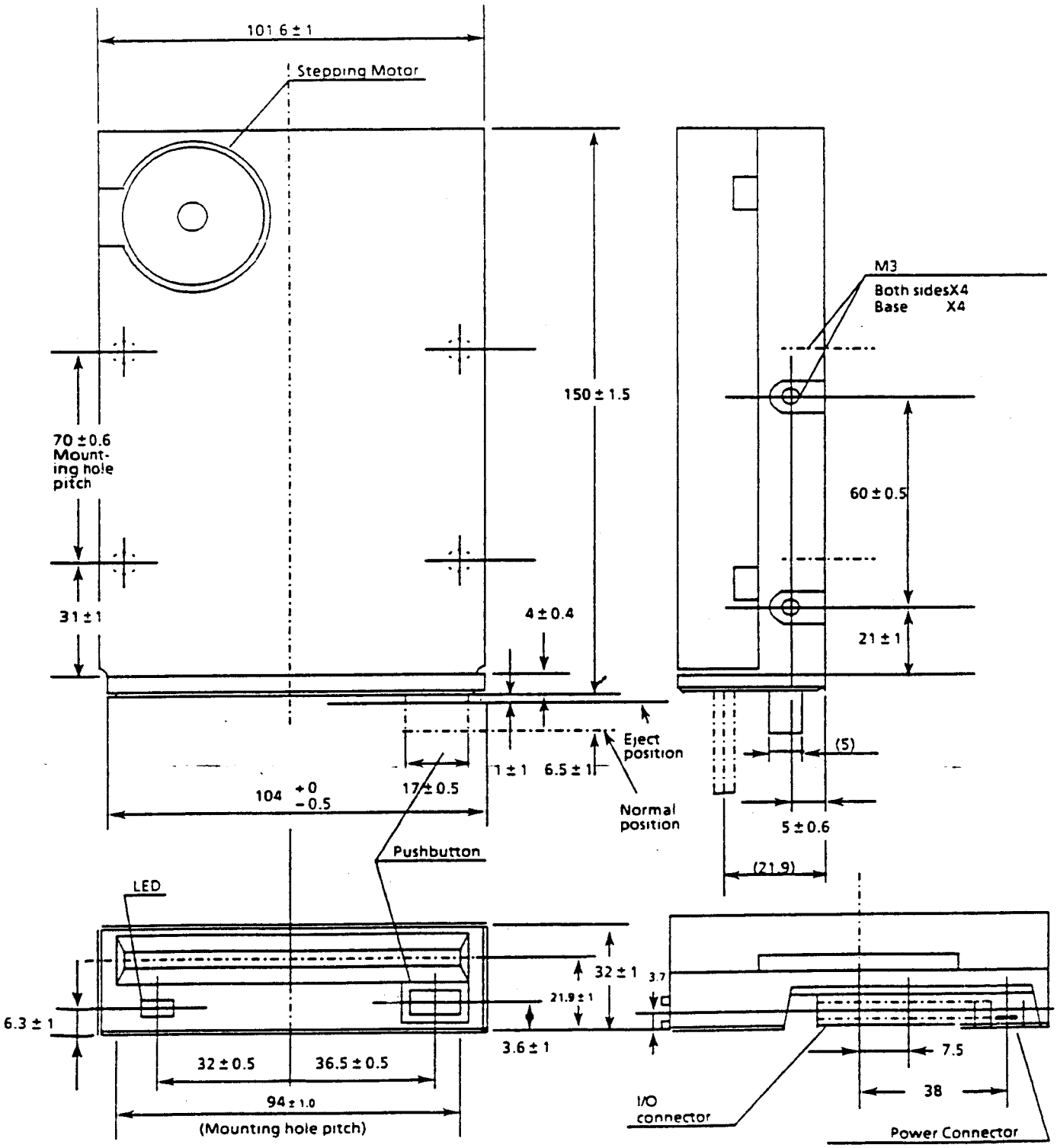
J2 CONNECTOR PIN

1	+ 5 VDC
2	+ 5 RETURN
3	+ 12 RETURN
4	+ 12 VDC



SHORTING BAR P2 PIN ASSIGNMENT

MECHANICAL DIMENSIONS



MECHANICAL DIMENSIONS

MICROCARTRIDGE HANDLING

To protect the cartridge, the same care and handling procedures specified for computer magnetic tape apply. These precautionary procedures are as follows:

a. Cartridges not intended for immediate use should be stored in the box.

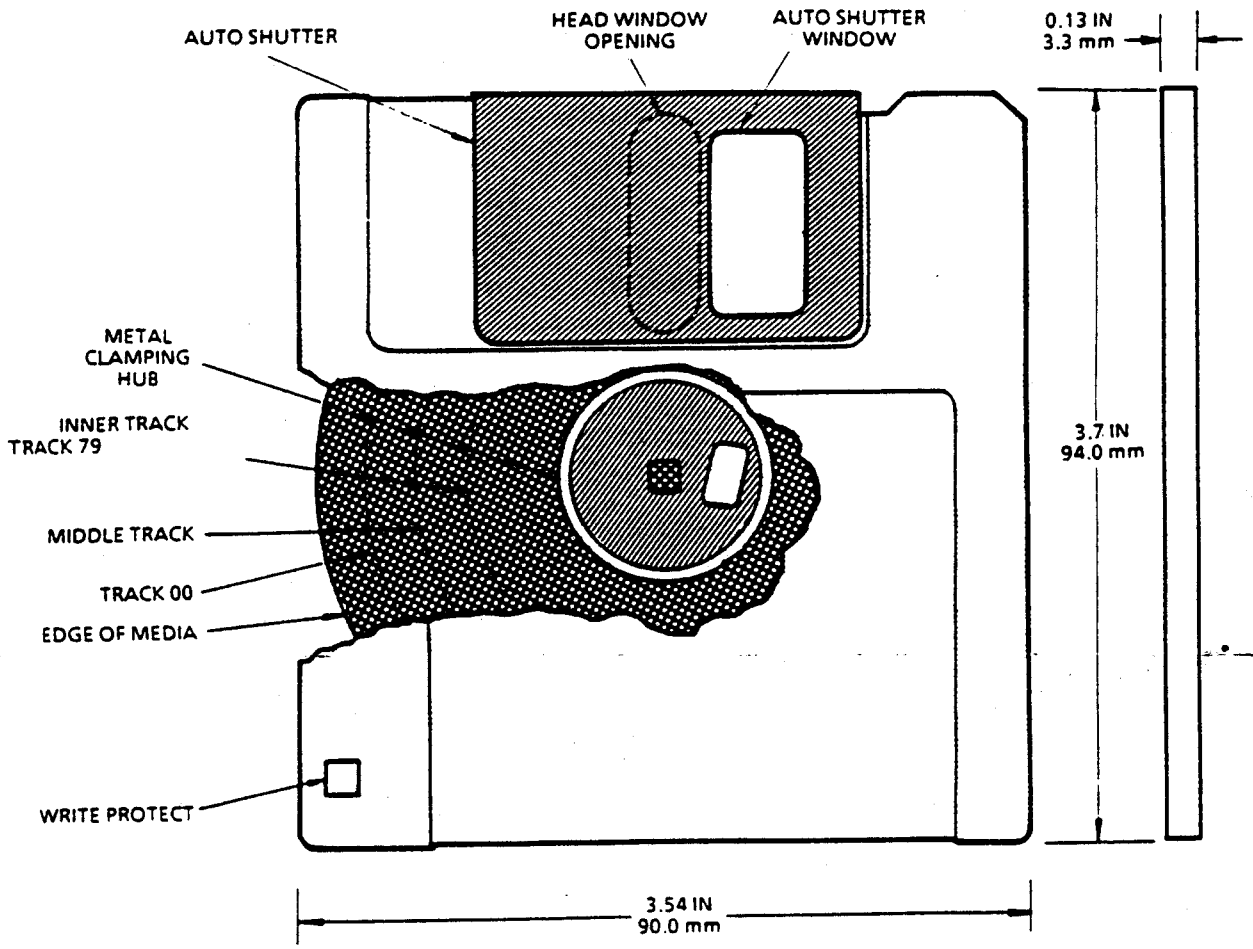
b. Keep cartridges away from magnetic fields and from ferromagnetic materials which might become magnetized. Strong magnetic fields can distort recorded data on disk.

c. Place ID labels in correct location, never use in reverse.

d. Do not use erasers.

f. Heat and contamination from carelessly dropped ash could damage disk.

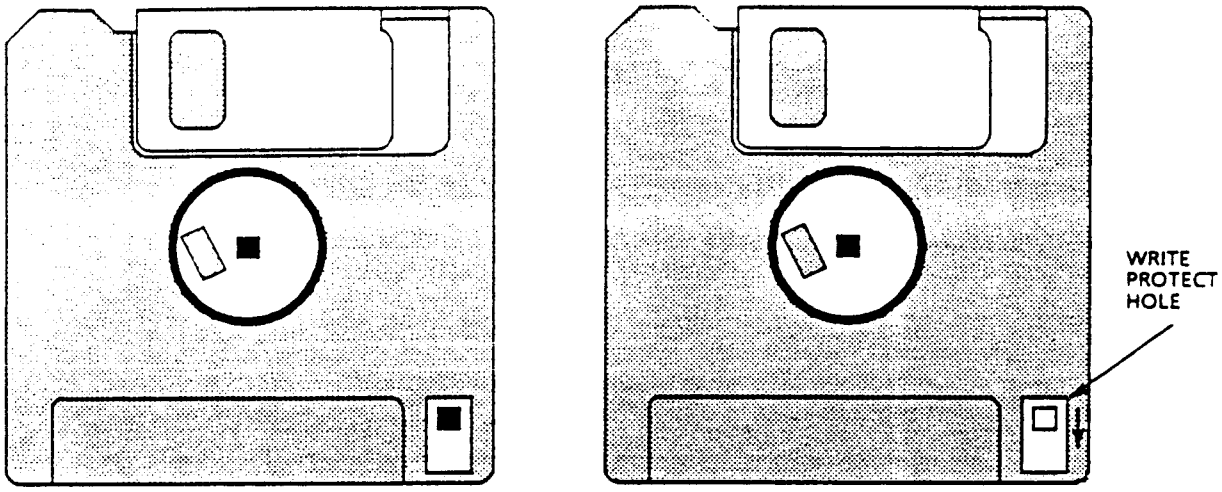
e. Do not expose cartridge to heat or sunlight.



MICROCARTRIDGE NOMENCLATURE

WRITE PROTECT FEATURE

The microcartridge comes with a mechanical write protect tab. To write protect the cartridge, turn the mechanical tab as shown in figure 8-3 to uncover the write protect hole.



WRITE ENABLED
HOLE CLOSED

SLIDE MECHANICAL TAB
AS SHOWN TO OPEN HOLE
WRITE PROTECTED

BOTTOM VIEW

WRITE PROTECT OPERATION

ELECTRICAL INTERFACE

INTRODUCTION

The interface of the JU-3X3 can be divided into two categories.

a. Signal Lines

b. Power Lines

The following paragraphs provide the electrical definition for each line. See figure 2-1 for all interface connections.

SIGNAL INTERFACE

The signal interface consists of two categories:

a. Control Lines

b. Data Transfer Lines

All lines in the signal interface are digital in nature and provide signals to the drive (input) or to the host (output) via interface connector P1/J1.

Input Lines

The input signals are of three types: those intended to be multiplexed in a multiple drive system, those which will perform the multiplexing, and those signals which are not multiplexed and affect all the drives in a daisy chain system.

The input signals to be multiplexed are:

a. DIRECTION SELECT

b. STEP

c. WRITE DATA

d. WRITE GATE

e. SIDE SELECT (JU-363 only)

The input signals which are intended to do the multiplexing are:

a. DRIVE SELECT 0

b. DRIVE SELECT 1

c. DRIVE SELECT 2

d. DRIVE SELECT 3

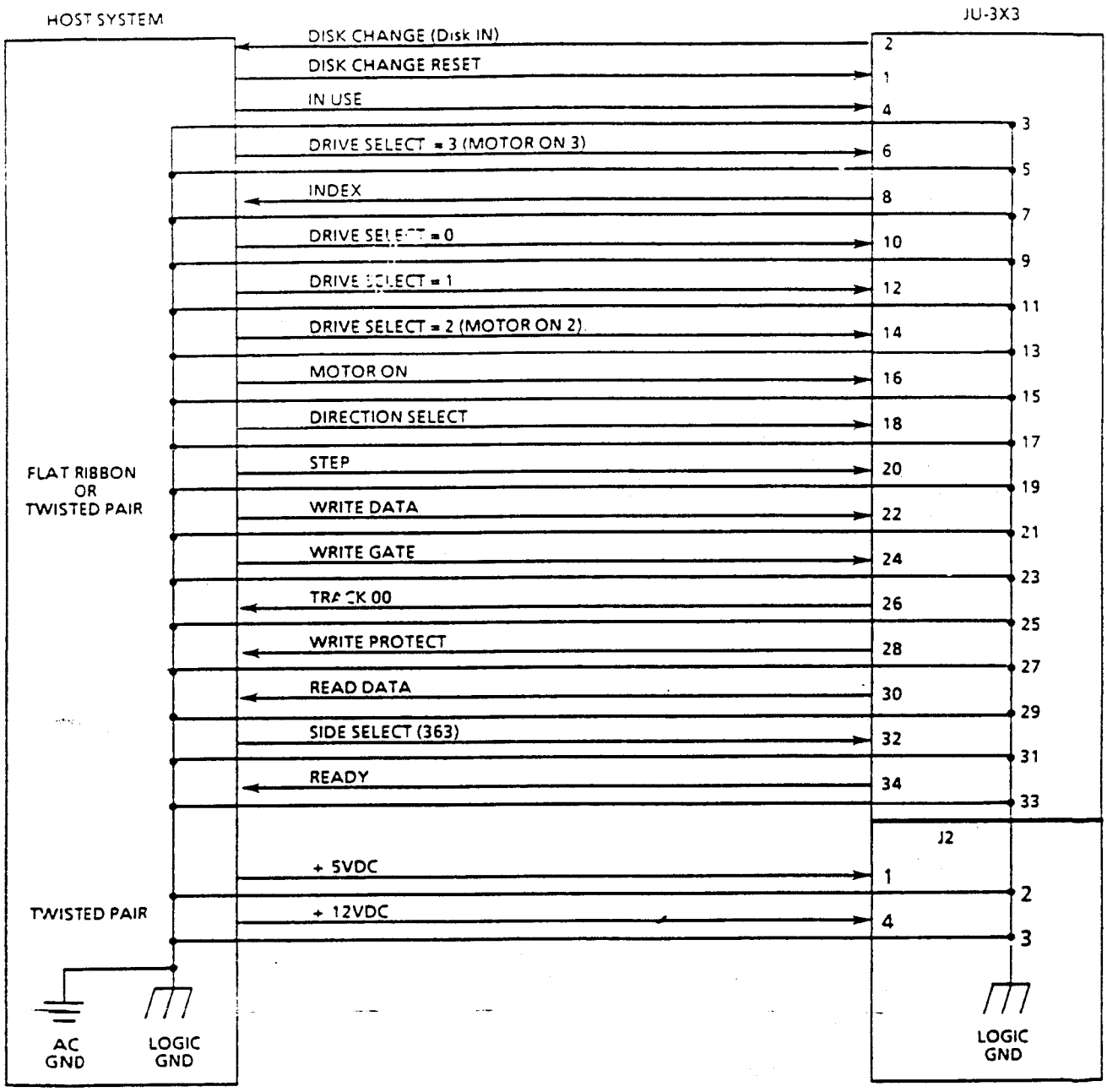
The signals which are not multiplexed are IN USE and MOTOR ON.

The input lines have the following electrical specifications. See figure 2-2 for the recommended circuit.

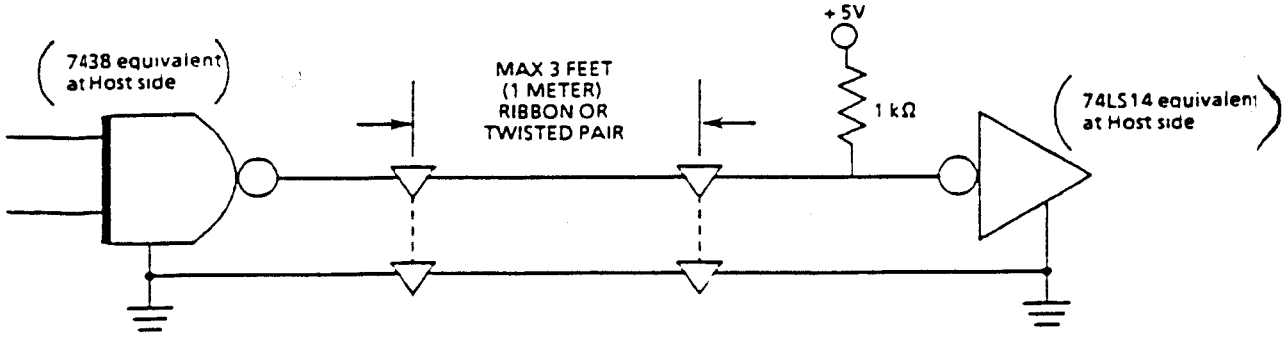
True = Logical zero = Vin + 0.0 to + 0.8V @ Iin = 6 mA (max.)

False = Logical one = Vin + 2.4 to + 5.25V @ Iin = 250 µA (open)

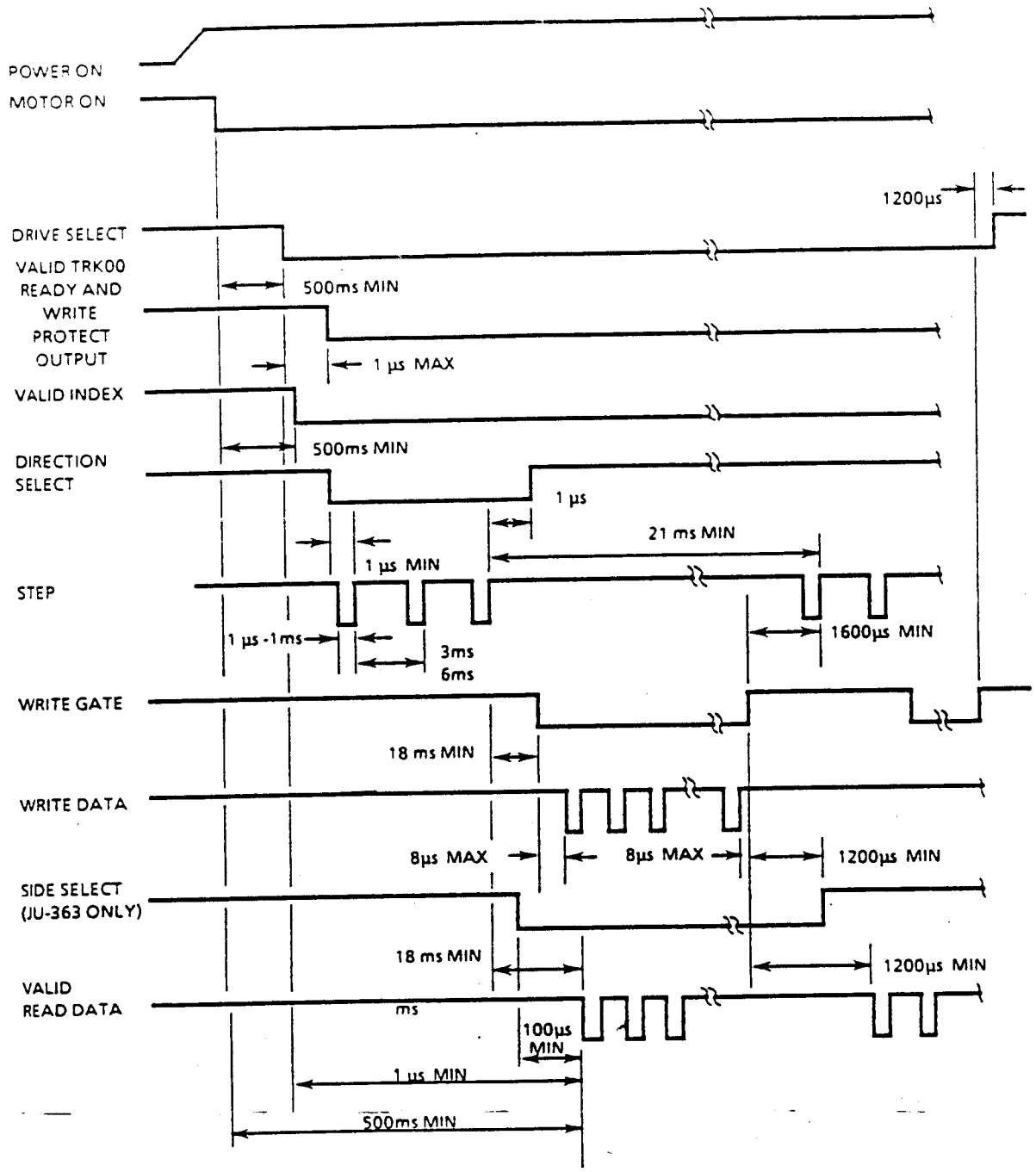
Input impendance = 1 k ohms



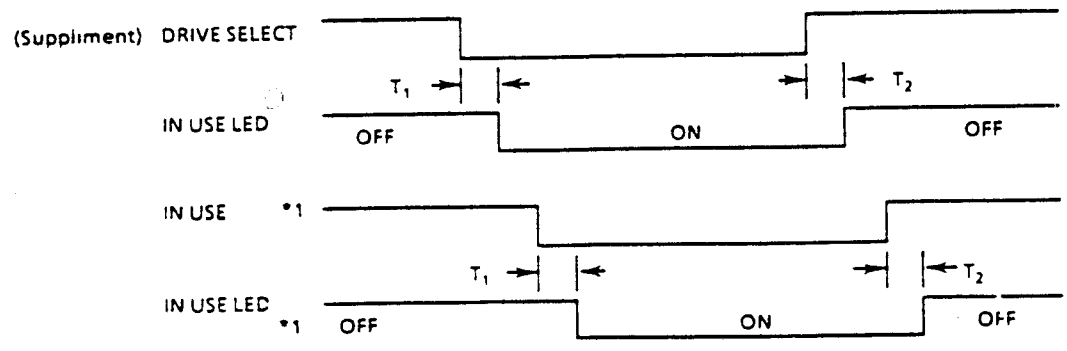
INTERFACE CONNECTIONS



INTERFACE SIGNAL DRIVER/RECEIVER



GENERAL CONTROL AND DATA TIMING REQUIREMENT



*1) PIN11 & 12 (Pin Post P2 on PCB) shorted. $T_1, T_2 \leq 0.5ms$

Input Line Termination

The JU-3X3 has been provided with the capability of terminating the seven input lines (eight input lines at JU-363) listed below.

a. MOTOR ON

b. DIRECTION SELECT

c. STEP

d. WRITE DATA

e. WRITE GATE

f. IN USE

g. SIDE SELECT (for JU-363 only)

h. DISK CHANGE RESET

These lines are terminated through 1 k ohm resistor arrays installed on all PCB.

In a single drive system, this resistor array provides 1 k ohm input impedance for input lines. In a multiple drive system, the input impedance is varied in value from 250 ohms to 500 ohms depending on the number of used drives.

Drive Select 1 – 4

Four separate input lines (DRIVE SELECT 0 through DRIVE SELECT 3) are provided so that up to four drives in a multiplexed system may have separate input pins. Only the drive with a unique DRIVE SELECT line active will allow the drive to respond to multiplexed input lines and enable the outputs to drive their respective signal lines. A logical zero on the interface selects a unique drive select line for the drive.

Motor ON

This input, when activated to a logical zero level, will turn on the drive motor allowing reading or writing on the drive. A 0.5-second delay after activating this line must be allowed before reading or writing.

Direction Select

This interface line defines the direction of motion the read/write head(s) will take when the STEP line is pulsed. An open circuit, or logical one, defines the direction as "out". If a pulse is applied to the STEP line, the read/write head(s) will move away from the center of the disk. Conversely, if this input is shorted to ground or a logical zero level, the direction of motion is defined as "in". If a pulse is applied to the STEP line, the read/write head(s) will move towards the center of the disk.

Side Select (JU-363 only)

This interface line defines which side of a two-sided diskette is used for reading or writing. An open circuit, or logical one, selects the read/write head(s) on the side 0 surface of the diskette. A short to ground, or a logical zero, selects the read/write head on the diskette's side 1 surface. When switching from one head to the other a 100 µs delay is required before any read or write operation can be initiated.

Step

This interface line is a control signal which causes the read/write head(s) to move in the direction of motion defined by the DIRECTION SELECT line. This signal must be a logical zero-going pulse with a minimum pulse width of 1 µs. Each subsequent pulse must be delayed by 3 ms (JU-323, 363), 6 ms (JU-313) minimum from the preceeding pulse for normal mode.

The access motion is initiated on each logical zero to logical one transition, or at the trailing edge of the signal pulse. Any change in the DIRECTION SELECT line must be made at least 1 µs before, and must be maintained 1 µs after the trailing edge of the step pulse. See Figure 1-3 for these timers.

Write Gate

The active state of this signal,or logical zero, enables write data to be written on the diskette. The inactive state, or logical one, enables the read data logic and stepper logic. See figure 1-8 for timing.

Write Data

This interface line provides the data to be written on the diskette. Each transition from a logical one level to a logical zero level will cause the current through the read/write head to be reversed, thereby writing a data bit. This line is enabled by WRITE GATE being active. WRITE DATA must be inactive during a read operation. See Figure 1-9 for timings.

In Use

Normally, the activity LED on the selected drive will turn on when the corresponding DRIVE SELECT signal is active. The IN USE input instead of the DRIVE SELECT signal can activate the LED too.

Output Lines

The output control lines have the following electrical specifications. See figure 2-2 for the recommended circuit.

True = Logical zero = Vout +0.0 to +0.4V @ Iout = 6 mA (max)

False = Logical one = Vout +2.4 to +5.25V (open collector) @ Iout = 250 µA (max)

Track 00

The active or logical zero state of this interface signal indicates when the read/write head of the drive is positioned at track zero (the outermost track) and the stepper is locked on track. This signal is at a logical one level, or inactive state, when the read/write head is not at track 00. When the reads/write head is at track 00 and an additional step out pulse is issued to the drive, LSI logic will keep the read/write head positioned at track 00.

Index

This interface signal is provided by the drive each motor revolution. Normally, this signal is at a logical one level and makes the transition to the logical zero level each time a reflector is sensed.

With soft sectored media, there is one pulse on this interface signal per revolution of the diskette (200 ms). This pulse indicates the physical beginning of a track. See figure 3-4 for timing.

When using the INDEX signal, look for an edge or transition rather than a level for determining the status.

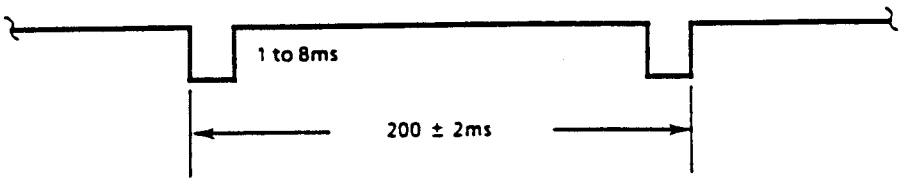


FIGURE 2-4 INDEX TIMING

Read Data

This interface line provides the "raw data" (clock and data together) as detected by the drive electronics. Normally, this signal is a logical one level and becomes a logical zero level for the active state. See Figure 1-6, 1-7 for the timing.

Write Protect

This interface signal is provided by the drive to indicate to the user that a write protected cartridge is installed. The signal is logical zero level when it is protected. The drive will inhibit writing with a protected diskette installed and, additionally, notifies the interface.

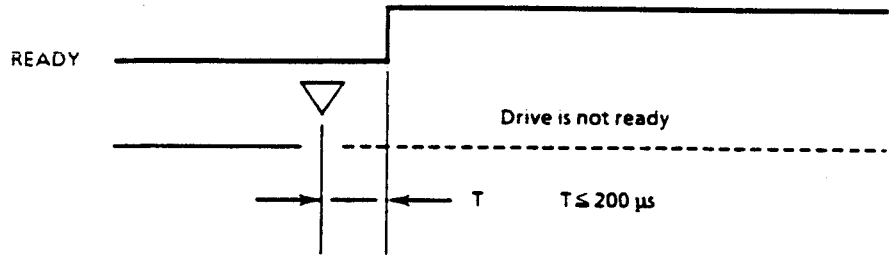
Ready

This interface line provides information on the status of the drive that allow the controller to operate, all the functions of the drive under the following conditions.

a. A cartridge is inserted in the drive.

b. The motor is on and up to speed.

c. DC power is supplied to the drive.

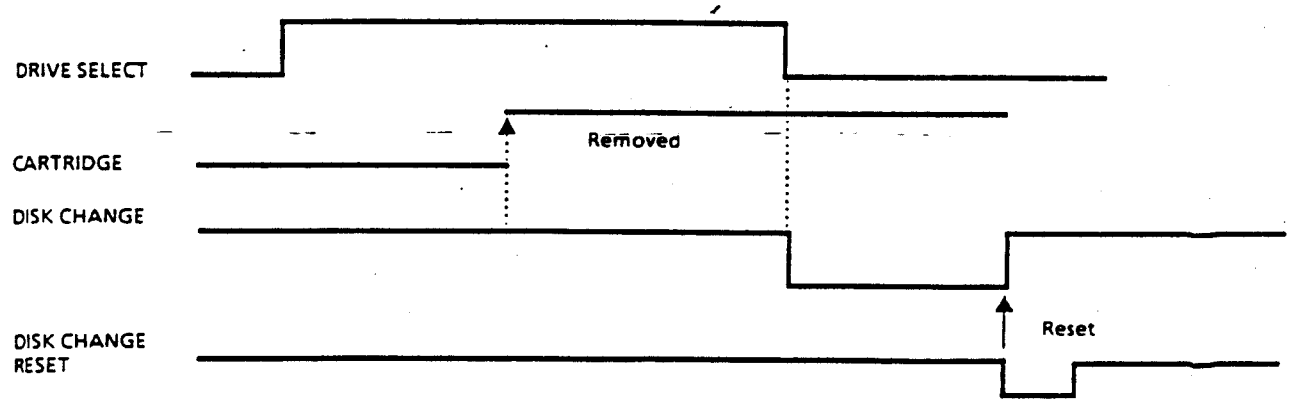


Disk Change (and Disk Change Reset)

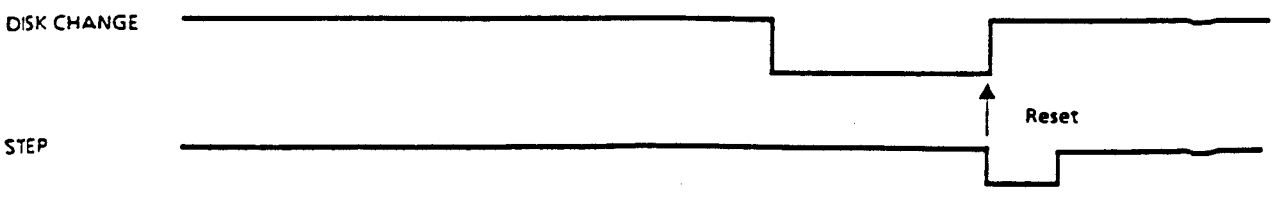
This interface signal is provided by the drive to indicate the condition that disk cartridge is ejected while the drive is deselected, and output when DRIVE SELECT line is activated.

This Disk Change line can be reset with Disk Change Reset, adding to this, if the shorting pin 16 and 18 are shorted STEP signal can reset this signal.

1) Shorting bar DR (Pin 17, 18) is shorted.

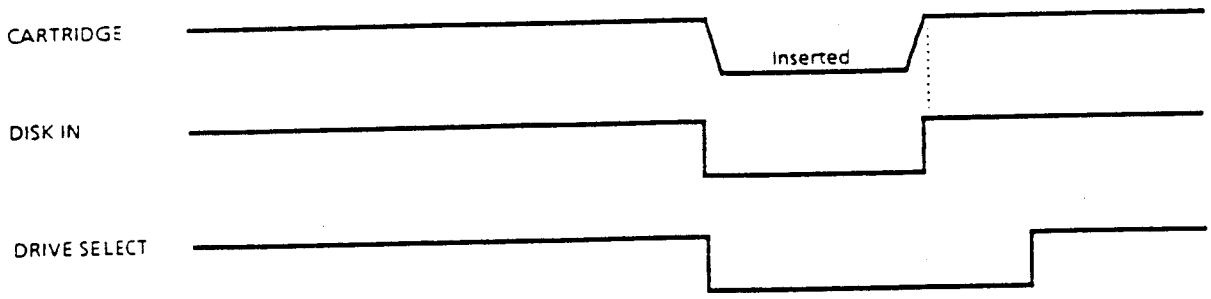


2) Shorting bar (Pin 16,18) is shorted.



Disk In (Option)

This signal is output for stating the condition of cartridge inserted. When the shorting pin 13 and 15 rather than 13 and 14, are shorted with shorting plug.



Normally, the drive is shipped at shorting pin 13 and 15 being shorted.

POWER INTERFACE

The JU-3X3 required only dc power for operation. DC power to the drive is provided via J2 located on the component side of the PCB. The two dc voltages, their specifications and their J2 pin designations and outlined in table 2-1. The specifications outlined on current requirements are for one drive. For multiple drive systems, the current requirements are a multiple of the maximum current times the number of drives in the system. Figure 2-5 illustrates the JU-3X3 dc power profile.

FRAME GROUND AND SIGNAL GROUND

The aluminum base plate of the drive is at the same electrical level as signal ground. Only the mounting bracket is contracted to the frame ground. This provides protection against radiation noise from outer systems.

TABLE 2-1. DC POWER REQUIREMENTS

J2 PIN	DC VOLTAGE	TOLERANCE	CURRENT	MAX RIPPLE (p to p)
1	+ 5 VDC	± 0.25 VDC	0.25 A MAX 0.22 A TYP	50 mV MAX ALLOWABLE
2	+ 5 RETURN			
3	+ 12 RETURN			
4	+ 12 VDC	± 1.2 VDC	0.21 A MAX 0.12 A TYP	100 mV MAX ALLOWABLE

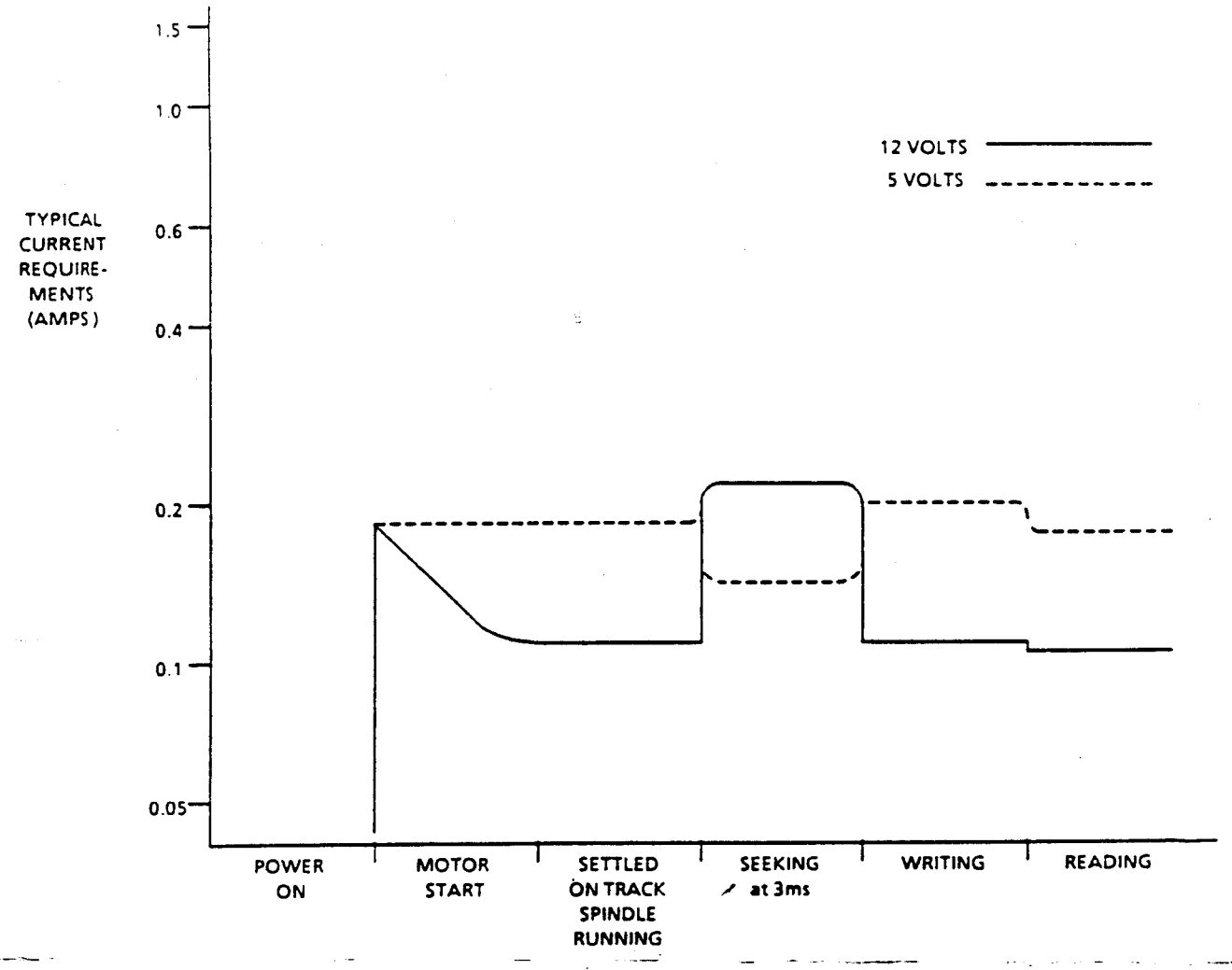
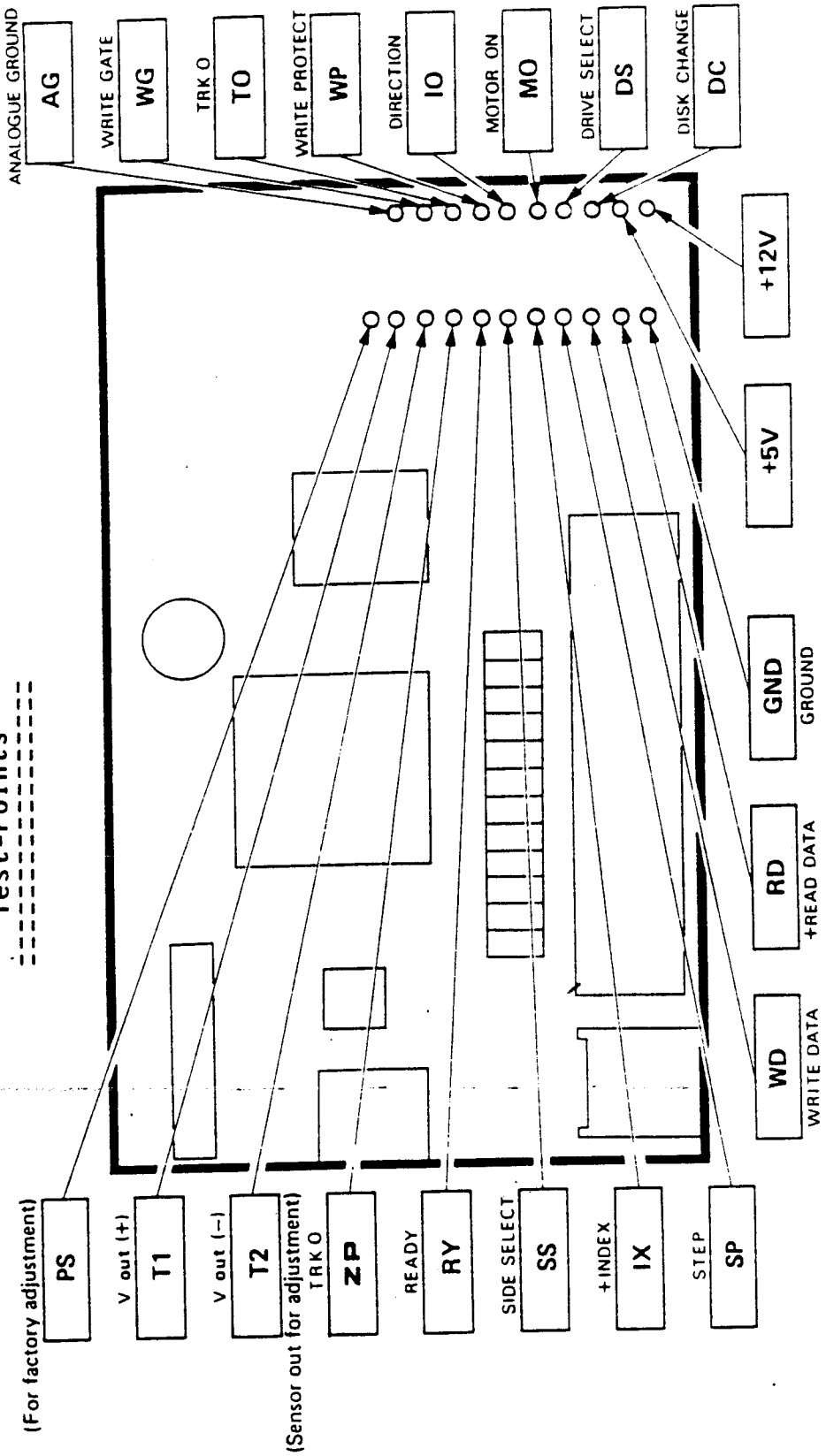


FIGURE 2-5 DC POWER PROFILE


Test-Points
ANALOGUE GROUND
AG
WRITE GATE
WG
TRK 0
TO
WRITE PROTECT
WP
DIRECTION
IO
MOTOR ON
MO
DRIVE SELECT
DS
DISK CHANGE
DC
+12V
+5V
GND
GROUND
RD
+READ DATA
WD
WRITE DATA
(For factory adjustment)
PS
V out (+)
T1
V out (-)
T2
(Sensor out for adjustment)
TRK 0
ZP
READY
RY
SIDE SELECT
SS
+INDEX
IX
STEP
SP

Radial Alignment

Normally, this adjustment is not necessary.

If the stepping motor mounting screws have loosened, or if parts have been damaged, or if a compatibility error has occurred, check and re-adjust as follows:

Steps 1 through 4 apply to both the CE and DAD types, except that alignment diskettes are different between them.

1. Insert an alignment diskette.

Caution: Be sure to leave the alignment diskette indoors for 20 minutes before starting radial alignment.

2. Step to track 40.
3. Synchronize oscilloscope on IX(– INDEX), and set time base to 20 ms/division. One revolution will be displayed.
4. Connect one probe to T1 and the other to T2. Ground the probes to GND and AG. Set inputs to AC, Add, and invert one channel. Set vertical deflection to 0.1 V/division (VARIABLE PULL) for the CE type, or to 2 mV/division for the DAD type.

* **Cat's Eye Type**

5. Check amplitude waveforms for Side 0 and Side 1. Waveforms such as shown in Fig. 4.2 can be seen.
6. The amplitude ratio of the two waveforms should be **60% or more.** If it is not, adjust as follows:
7. Loosen the two stepping motor mounting screws.
8. Turn the stepping motor along the base by hand until the lobes of the two waveforms have approximately the same amplitude, and re-tighten the mounting screws. (See Fig. 4.2.)
9. Seek from track 0 to 40 and from track 79 to 40, and check that radial alignment is correct.

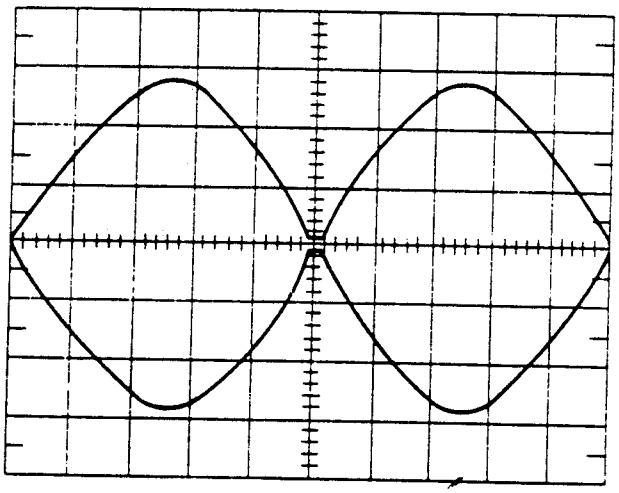
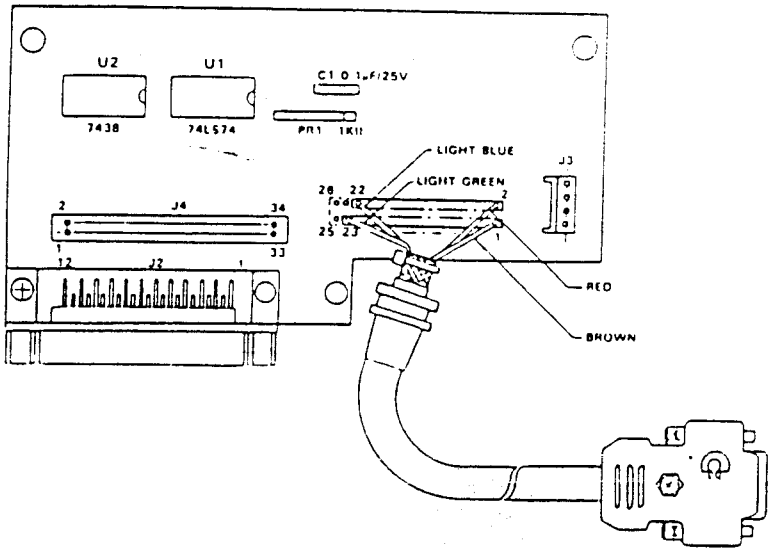
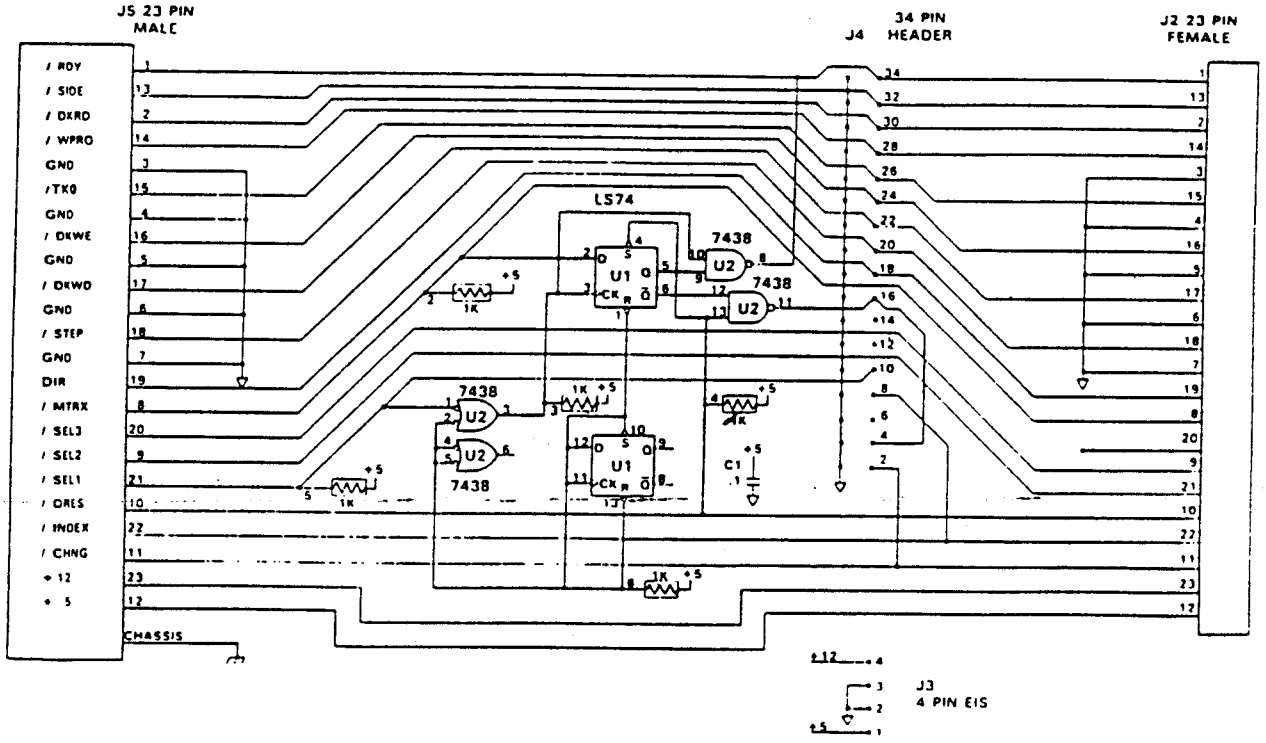


Fig. 4.2 Radial Alignment Waveforms (Cat's Eye)

INTERFACE PCB ASSY. #327204



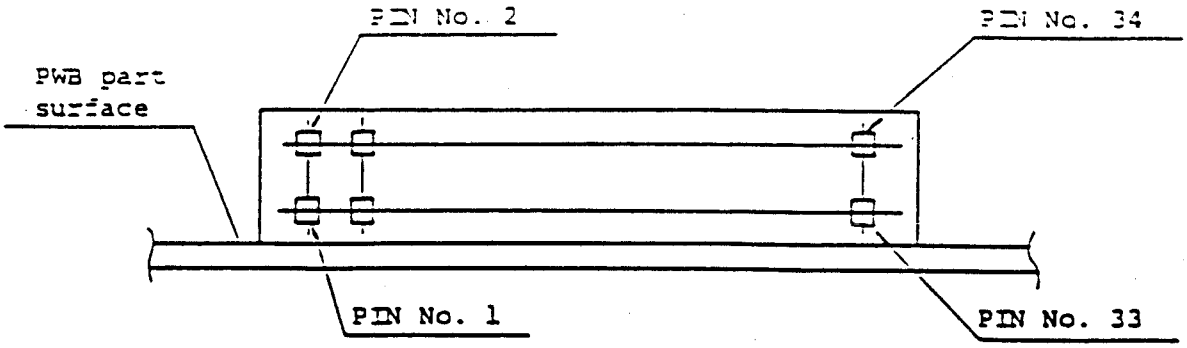
Board Layout



Interface Schematic

SIGNAL TYPES AND PIN CONFIGURATION

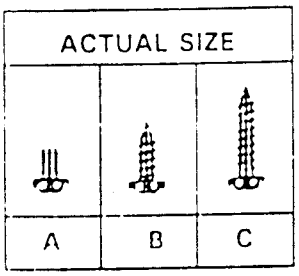
The following shows the signal connector pin configuration on the FD1035:



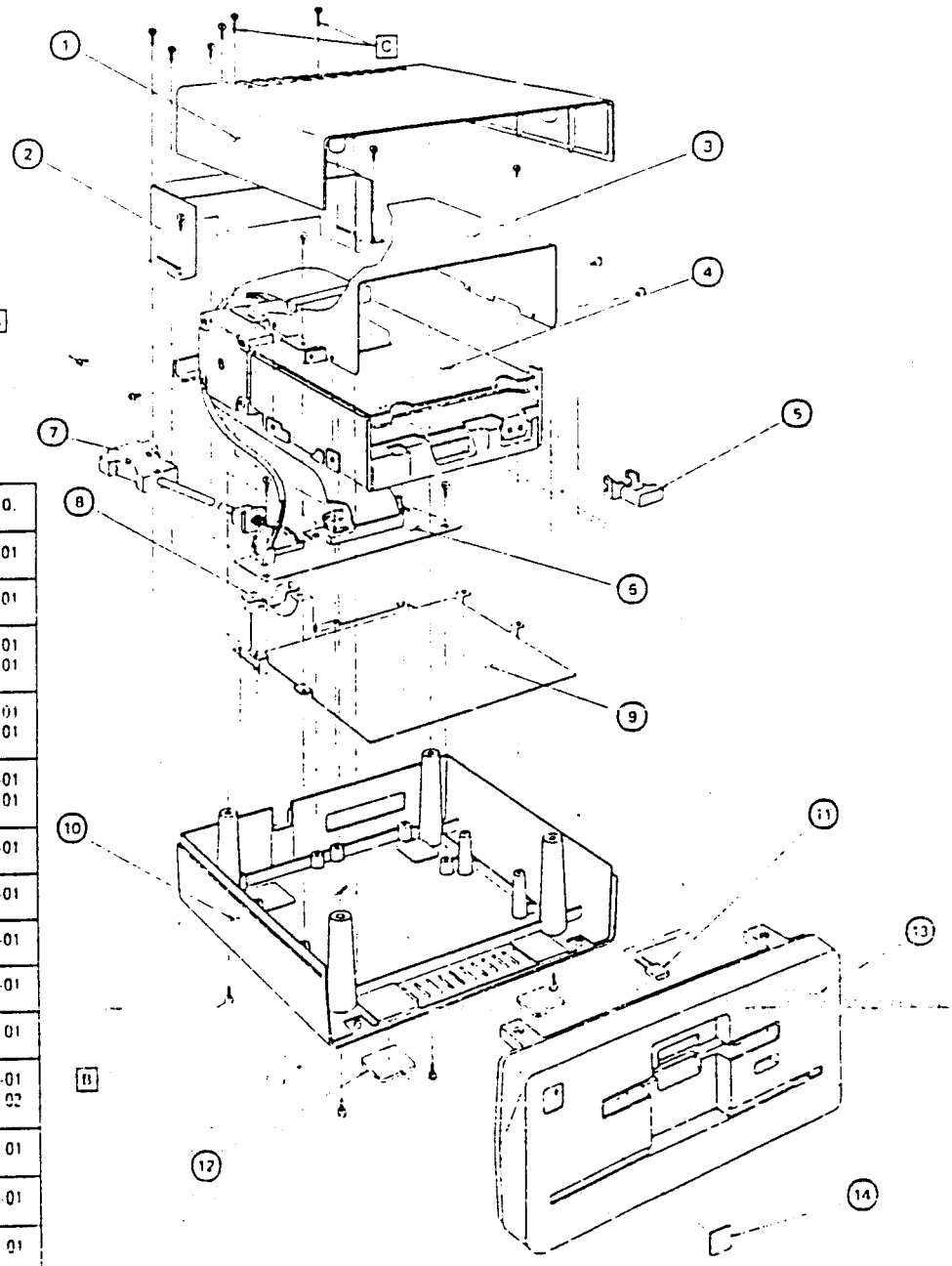
Signal name	I/O	Pin number	Pin number	Signal name
DISK CHANGE	Output signal	2	1	GND
(IN USE)	Input signal	4	3	GND
DRIVE SELECT 3	Input signal	6	5	GND
INDEX	Output signal	8	7	GND
DRIVE SELECT 0	Input signal	10	9	GND
DRIVE SELECT 1	Input signal	12	11	GND
DRIVE SELECT 2	Input signal	14	13	GND
MOTOR ON	Input signal	16	15	GND
DIRECTION SELECT	Input signal	18	17	GND
STEP	Input signal	20	19	GND
WRITE DATA	Input signal	22	21	GND
WRITE GATE	Input signal	24	23	GND
TRACK 00	Output signal	26	25	GND
WRITE PROTECT	Output signal	28	27	GND
READ DATA	Output signal	30	29	GND
SIDE SELECT	Input signal	32	31	GND
READY	Output signal	34	33	GND

2. 3.5" EXTERNAL DRIVE DISASSEMBLY

2.1 ASSEMBLY OVERVIEW



POS.	DESCRIPTION	PART NO.
1	TOP CASE	327011-01
2	RFI TOP SHIELD	327116-01
3	DRIVE MTG BRACKET-NEC DRIVE MTG BRACKET-PANA	327143-01 327144-01
4	3.5" DRIVE ASSY-NEC 3.5" DRIVE ASSY-PANA	327141-01 327142-01
5	DISK EJECT BUTTON-NEC DISK EJECT BUTTON-PANA	327006-01 328117-01
6	INTERFACE PCB ASSY	327204-01
7	INTERFACE CABLE ASSY	327164-01
8	CABLE CLAMP ASSY	327208-01
9	RFI BOTTOM SHIELD	327117-01
10	BOTTOM CASE	327010-01
11	LED ASSY NEC LED ASSY PANA	327175-01 327175-02
12	RUBBER FOOT	327053-01
13	FRONT BEZEL	327012-01
14	NAMEPLATE AMIGA LOGO	327113-01
PARTS NOT ILLUSTRATED.		
	RIBBON CABLE ASSY DATA CABLE ASSY POWER USERS INSTRUCTION SHEET	327206-01 327207-01 327202-01



Assembly Overview

THE MAJOR ASSEMBLIES IDENTIFIED

PART NO.	DESCRIPTION
312594-01	DISK DRIVE ASSEMBLY - CHINON
312594-02	DISK DRIVE ASSEMBLY - PANASONIC

REVISIONS

LTR	ZONE	DESCRIPTION	DATE	APPROVED
1		ADVANCE ENGINEER REL.		
2		PILOT PRODUCTION RELEASE		

1. SHEET 3 OF 3 SIZE C
   ASSY DWG
NOTES:

commodore

TITLE DISK DRIVE ASSEMBLY AMIGA - A500

DRAWN BY T. COLEY — DATE 11-26-8
CHKD
ENGR H. MUELLER — 11-26-8
APPR
SIZE B
DRAWING NUMBER 312594-1
SHEET 1 OF 3

QUANTITY REQD PER PART / DASH NO. 02	QUANTITY REQD PER PART / DASH NO. 01	ITEM	OS	PART NUMBER	DESCRIPTION	REF DES	BEND	NOTES
	1	1		312554-01	3.5" FLOPPY DISK DRIVE – CHINON			
		2						
1		3		327142-01	3.5" FLOPPY DISK DRIVE - PANASONIC			
		4						
1	1	5		327206-03	CONNECTOR CABLE 125mm			
		6						
2	2	7		907183-02	STAND-OFF M3 M/F HEX.			
		8						
1	1	9		327207-02	POWER CABLE 125mm			
		10						
1		11		328117-01	BUTTON - PANASONIC			
		12						
1	1	13		906800-05	SCREW, METRIC - M3X6			
		14						
		15						
		16						
		17						
		18						
		19						
		20						
		21						
		22						
		23						
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		30						
		31						
		32						
		33						
		34						
		35						
		36						
		37						

commodore

TITLE: DISK DRIVE ASSEMBLY AMIGA - A500

DRAWN BY: T. COLEY DATE: 11-26-86

CHKD:

ENGR: N. ANSTELLER DATE: 11-31-86

APPR:

SIZE: B | 312594 | REV: 2 | SHT: 3

ADVANCED REPRO

PHYSICAL, Cont'd.

Connectors:	
AC -	Shall meet the specifications in Commodore drawing 903508 - Power Cord International.
DC -	7 pin DIN circular male plug with key. Connector shield shall be clamped and soldered to the cable shield. Refer to Figure 2 for detailed connector specifications and wire list.
Cable:	Five (5) conductor with copper braid (90% coverage). Refer to Figure 2.
Power Switch:	An externally accessable switch (SPST) shall be in series with the AC input.

ELECTRICAL

AC Input:	105 - 132 VAC (01) 198 - 242 VAC (02) 216 - 264 VAC (03,04)
AC Input Frequency:	57 - 63 Hz (01) 47 - 53 Hz (02, 03, 04)
DC Output Voltages:	+5.0VDC ± 0.05 VDC +12.0VDC ± 0.6VDC -12.0VDC ± 0.6VDC
Output Current:	+5.0VDC = 4.5A maximum +12.0VDC = 1.0A maximum -12.0VDC = 0.1A maximum
Maximum Continuous Output Power:	Any combination within the following range is allowed such that the total power does not exceed 35 watts.
+5VDC -	30% to 100% rated load
+12VDC -	15% to 100% rated load
-12VDC -	15% to 100% rated load
Line, Load and Cross Regulation:	Measured at output connector with 30% to 100% rated load.
+5VDC -	± 5%
+12VDC -	± 10%
-12VDC -	± 10%
	Refer to Table 2 for measurement procedure.

COMMODORE		TITLE: Power Supply, External - Consumer Amiga	
SIZE	DRAWING NO. 312503	REV	SCALE / SHEET

ELECTRICAL, Cont'd.

Ripple and Noise:	Refer to Table 2 for measurement procedure.
+5VDC -	100 mV peak to peak
+12VDC -	200 mV peak to peak
-12VDC -	200 mV peak to peak
Overvoltage Protection:	Refer to Table 2 for over shoot.
+5VDC -	+6.0VDC minimum. +7.0VDC maximum.
Overcurrent Protection:	The unit shall tolerate a short circuit (= 0.1 ohm) condition on any or all outputs for an indefinite duration without exceeding the case temperature requirements of regulatory agencies or 90°C whichever is lower.
Input Surge Protection: (Varistor)	3KV, 25 ampere for 3ms minimum.
Efficiency:	50% minimum at nomial input, maximum loads.
Hold-up Time:	16.67ms minimum at minimum AC input, 100% load.
Transient Response:	200 μs maximum for +5VDC output to stabilize after 5% change on 50% load.
Line Filter:	AC input shall have an internal EMI line filter.
Input Current Protection:	Turn-on inrush current not to exceed 20 ampere
No Load Input Current:	0.1 ampere maximum @ 117 VAC 0.05 ampere maximum @ 220 or 240 VAC
Dielectric Withstanding Voltage:	1,000 VAC for one (1) minute.

ENVIRONMENTAL

Operating Temperature:	0° to +50°C
Operating Humidity:	5 to 95% RH non-condensing
Operating Altitude:	0 to 3,000 meters
Storage Temperature:	-20° to +50°C
Storage Humidity:	5% to 95% RH non-condensing
Storage Altitude:	0 to 15,000 meters
Shock:	30g's 21 m seconds ½ sine, two shocks in each of six (6) directions.

RELIABILITY

MTBF:	50,000 hours - minimum @ 35°C, nominal input, 75% load all outputs.

COMMODORE		TITLE: Power Supply, External - Consumer Amig	
SIZE / DRAWING NO. 312503	REV.	SCALE	SHEET

TABLE 2 - NOTES

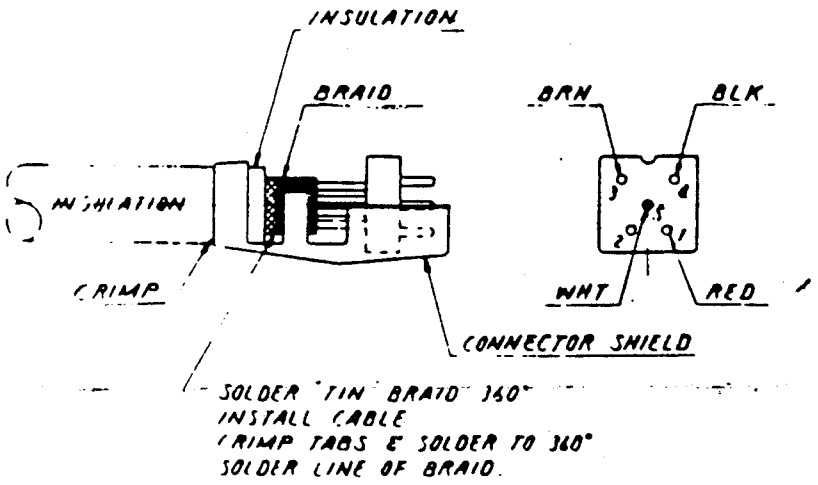
A. Line Regulation - is defined as the maximum allowable deviation of an output voltage above or below its specified nominal value when the AC input is taken above or below its nominal value to the rated maximum or minimum level.

B. Load Regulation - is defined as the maximum allowable deviation of an output voltage above or below its specified nominal value when the load is taken above or below its nominal value to the rated maximum or minimum level.

C. Cross Regulation - is defined as the effect seen in any auxiliary output when a change is made in the main +5 VDC output. The auxiliary output being measured is loaded to 20% of its maximum capacity and the main output is loaded to 60% of its maximum with a change of ± 30%. The effect of one auxiliary output on another is measured in the same way; that is, the measured output is 20% loaded and the effecting output is loaded 60% ± 30%.

D. Ripple and Noise - is measured at maximum rated load and is the peak to peak combination of ripple and noise. The measurement is made at the output connection.

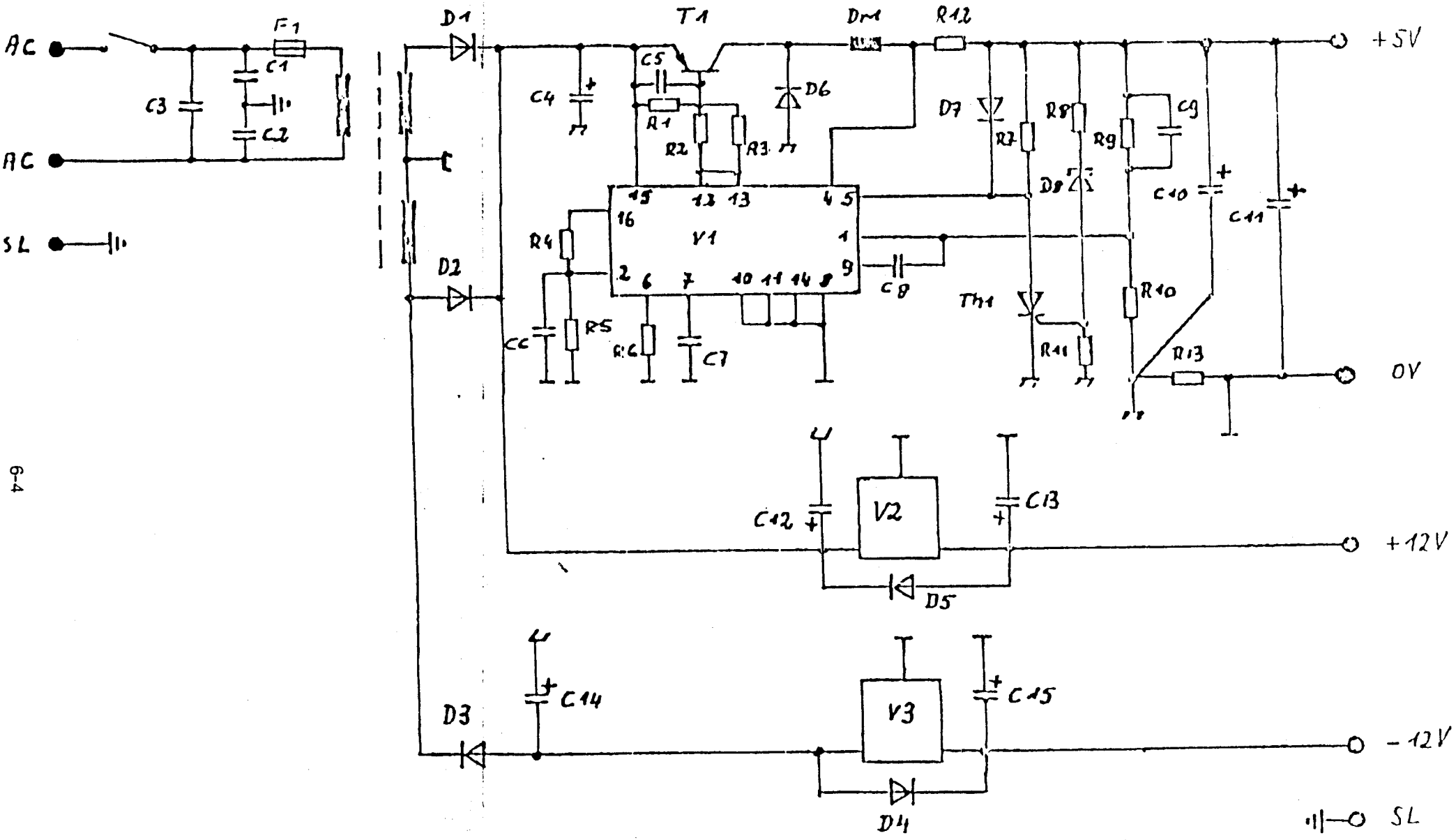
FIGURE 2 - POWER SUPPLY CONNECTOR



Wire List

PIN	SIGNAL	COLOR	GAUGE
1	+5VDC	RED	18
2	SHIELDED GND		
3	+12VDC	BRN	22
4	SIGNAL GND	BLK	18
5	-12VDC	WHT	22

COMMODORE		TITLE: Power Supply, Exterral - Consumer Amiga	
SIZE	DRAWING NO. 312503	REV	SCALE / SHEET



6-4

BV 870219.05

Amiga 500

Elektrische Bauelemente A 500

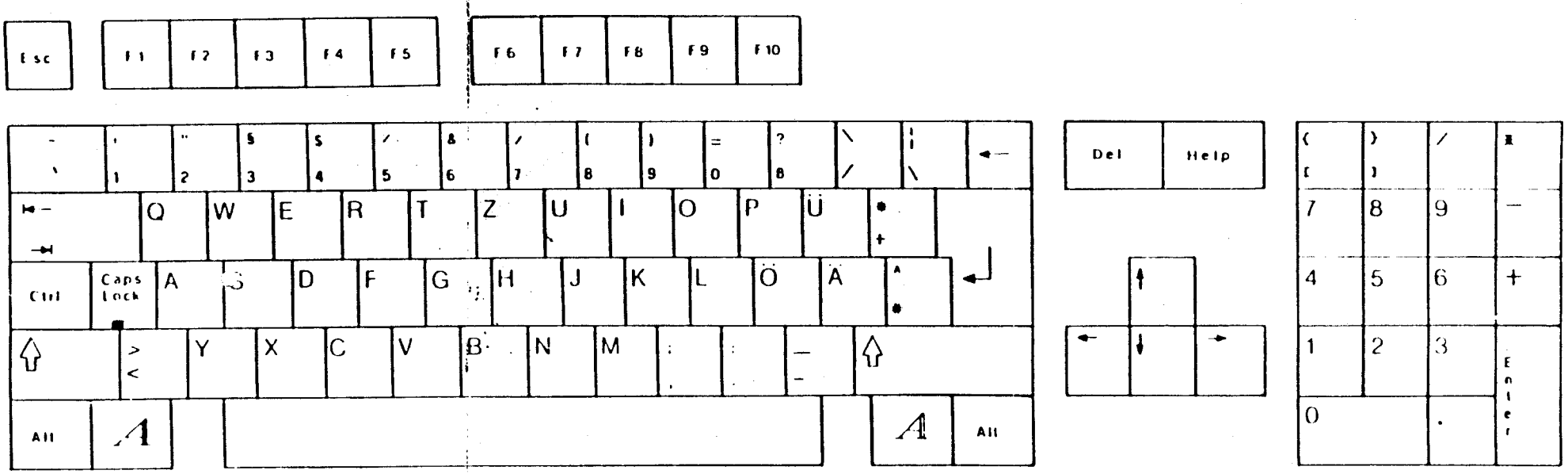
R1	47	
R2	180 1/2 Watt	
R3	180 1/2 Watt	
R4	4k7 1%	
R5	1k5 1%	
R6	12k 1%	
R7	47	
R8	47	
R9	4k7 1%	
R10	1k5 1%	
R11	47	
R12	16 mm aktive Länge Manganindraht 0.5 Ø	
R13	11 mm aktive Länge Manganindraht 0.5 Ø	

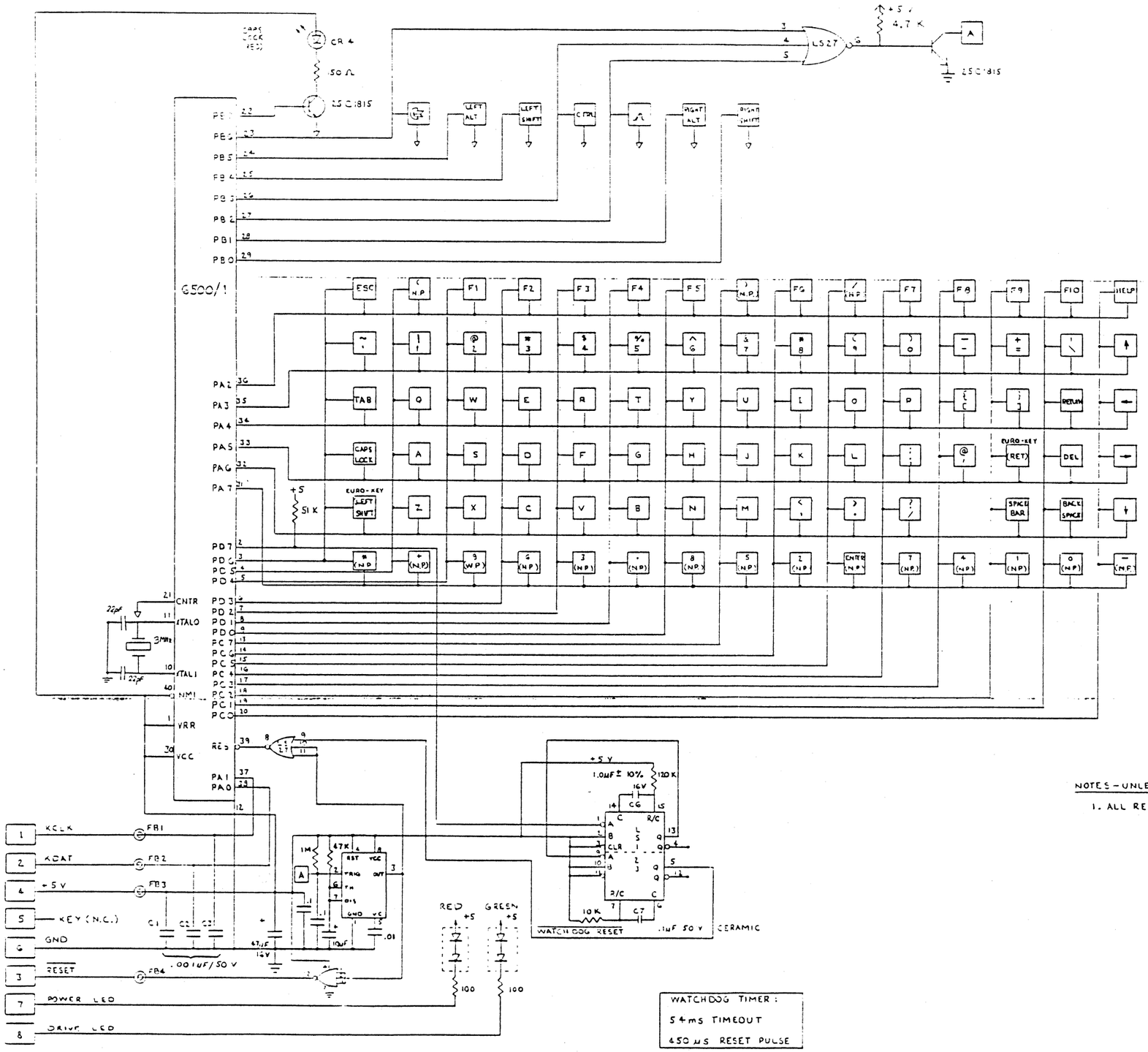
C1	2n5 250V	Y
C2	2n5 250V	Y
C3	0.1 u 250V	X
C4	4700 u/25V	
C5	2n2 10%	
C6	0.1 u	
C7	2n2 10%	
C8	15n 10%	
C9	0.1 u	
C10	4700 u/6V	
C11	22u/16V	
C12	220u/25V	
C13	22u/16V	
C14	220u/25V	
C15	22u/16V	

D1	1N5401
D2	1N5401
D3	1N4001
D4	1N4148
D5	1N4148
D6	SB530 o. ähnlich
D7	1N4001
D8	ZPD5V6

T1	D45H2
Th	TL106 o. ähnlich
V1	SG3524 B, UC3524A
V2	7812
V3	7912
Dr	40uH/5A
F1	T315mA 5x20 (für 220V-Version BV 870219.03) T600mA 5x20 (für 117V-Version BV 870219.01)

GERMAN KEYBOARD (d)





NOTES – UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS ARE 1/4 W, 5% TOLERANCE.

WATCHDOG TIMER:

54 ms TIMEOUT

450 μS RESET PULSE

UNLESS OTHERWISE SPECIFIED: TOLERANCES ON DECIMALS	DRAWN BY C.J. WOOTERS	DATE 9-10-86	commodore
	CHKD		KEYBOARD
	ENGR		CONSUMER AMIGA
	APPR		
MATERIAL / FINISH	USED ON	NEXT ASSY	SIZE D 315502 REV
			SCALE: ~ SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	SEE PAGE 1	3-17-87	4-4-87

J1
23 PIN FEMALE
R
G
B
GND
CSYNC
+12V
FB1
+5V
IC2 74LS74
IC2 74LS74
R12 330
R9 330
R10 330
C3 22u/16V
C5 22u/16V
C6 22u/16V
R1 1K
R3 1K
R2 1K
R21 4.7K
C19 0.1u
R22 1K
R20 910
C11 0.01u
L2 33uH
R11 3.3K
C17 1000P
R25 10K
Q2 2SC945
C22 16P
XTAL1
R26 470
C23 56P
C25 820P
L3 15uH
C26 0.1u
R27 4.3K
C13 47P
R8 56K
C2 0.01u 5%
C10 0.1u
IC1 MC1377
VP OUT
CHROMA OUT
CHROMA IN
CSYNC
LUM OUT
OSC
LUM IN
C14 0.1u
C12 0.1u
C7 2.2u
C9 0.01u
R14 1.5K
K1
2SC945A
R24 75
COMP OUT
R23 1.5K
C18 470P
R15 220
C20 56P
C21 0.001u
R12 3.3K
C24 33P
K2
C16 0.1u
C1 15pF
L1 10uH
R7 1.5K
Q1 2SC945
R13 75
C4 10u/10V
R17 1.5K
C8 470P
R6 56
R8 4.7K
R19 220
C15 0.022u
VR 1KΩ
*C5 2SC1730
Q1
R4 110
C8
T1
D1
D2
R2 3.3K
C7 22 NPO
C6
R3 4.
R5 100
C9 33P
R6 100
R1 5.6K
T1 10mH
C10
R8 240
R7 100
R9 120
L5
RF O/P
L2 10mH
L3 3.3mH
L4
D3 5.1V HZ5C2
C1 0.056u
C3
C4
R10 1K
T2
R15
C13 1000P
R12 3.3K
C14 0.056u
SW
AUDIO I/P
R11 1.5K
C12 10u/16V
Q2 2SC460
C15 47P NPO
C17 6P N330
VC1 2-18P
R14 6.8K
C16 120P NPO
C11 2200P
R13 6.8K

Will be changed shortly via ECO

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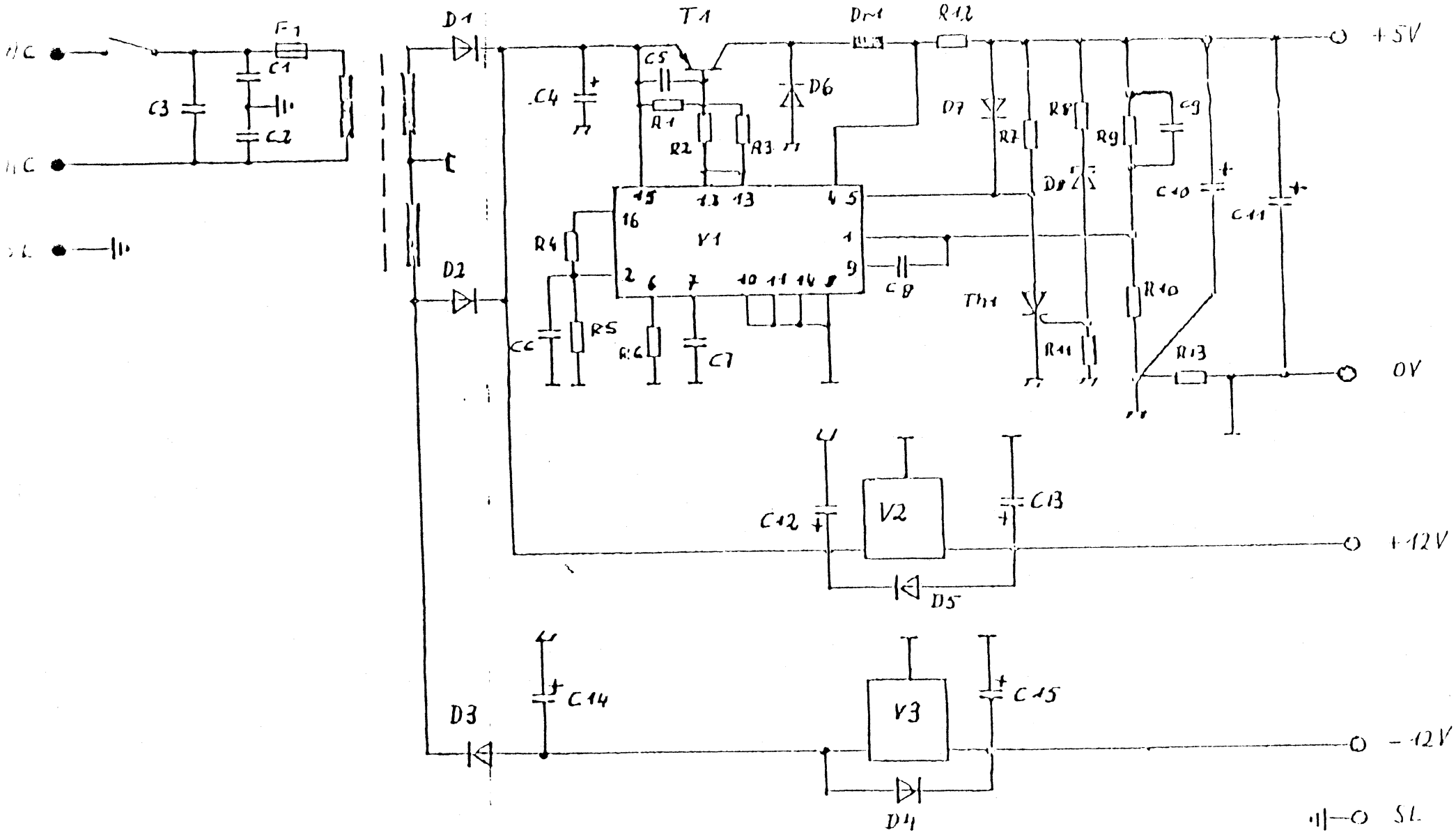
UNLESS OTHERWISE SPECIFIED
TOLERANCES ON DECIMALS
MATERIAL
FINISH
USED ON A520
NEXT ASSY

CETL NO: 52A013
commodore (UNIX)
SCHEMATIC, A520 PAL
SIZE C | 355205 | REV A
SCALE NONE | SHEET 2 OF 2



BV 870279.03

Amiga 500